PACIFIC DISCOVERY

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A JOURNAL OF NATURE AND MAN **PACIFIC DISCOVERY** IN THE PACIFIC WORLD

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PRE-DISCOVERY

NEW ZEALAND and California do not seem to us to be quite so wide an ocean apart after the pleasant task of putting together this special issue. Friendly contact is the best shortener of sea miles, or air miles. There has been for several months a barrage of manuscripts, photographs, maps, and correspondence over the Pacific from Wellington, Auckland (they pronounce it Oakland), Christchurch, and Dunedin to San Francisco. (Incidentally, some record or other has been set: every single MS sent us from New Zealand is herewith returned — in print.) *PD* thanks the contributors of words and pictures — they have made this issue, not the editor. The latter, who has never been to New Zealand, owes a personal debt of thanks to two young New Zealanders, Mr. and Mrs. W. A. Wilson — Erica and Sandy — who last year, with one companion, sailed a 53.8-foot (over-all) auxiliary cutter from New Zealand to San Francisco Bay, to join the company of New Albion Films. They kindly checked over page proofs for possible boners — the editor is still responsible for any that may turn up. Our largest indebtedness is to Thane Riney, who by persuasion (nothing more drastic, we trust) secured all but two of the MSS that make this issue.

Here are some credits, with thanks, not appearing elsewhere — for title cuts: page 2, Maori carved door, courtesy Bernice P. Bishop Museum; page 8, Maori shark-tooth knife, courtesy Peabody Museum of Salem; page 13, Maori carved face, courtesy Biship Museum; page 19, Maori canoe prow, courtesy the University Museum, Philadelphia; page 23, Maori carved face at the Waitangi Meeting House, from Thane Riney; page 28, Maori incised gourd bowl for cooked birds, courtesy Bishop Museum; page 30, Maori house posts, courtesy Bishop Museum.

DISCOVERING PD'S AUTHORS

OUR NEW ZEALAND authors have made this special issue an important and permanent part of the record of nature and man in the Pacific. We thank them on behalf of the California Academy of Sciences. . . . ¶**D. W. McKenzie,** M.Sc., is Senior Lecturer in the Department of Geography, Victoria University College. With a long background in museum educational wark, he has made photography a special interest and has published a number of technical papers. . . . ¶**R. A. Falla,** M.A., D.Sc., Director of the Dominion Museum, past president of the Royal Society of New Zealand, is the country's most active ornithologist and a leading authority on the distribution and systematics of Southern Hemisphere oceanic birds. . . . ¶**G. C. Shaw,** Geologist and Curator of New Zealand rocks and fossils at the Dominion Museum, devotes himself to educational and extension work and the preparation of exhibits. . . . ¶**W. H. Dawbin,** M.Sc., Lecturer, Department of Zoology, Victoria University College, working from a general interest in marine biology and the ecology of the outlying islands, is now studying the life history of the *Sphenodon.* His work on whale migration has taken him from the tropics to the sub-antarctic. . . .¶**Derisely F. Hobbs,** Senior Fisheries Officer, Marine Department, is chiefly known as a fisheries biologists with substantial contributions to knowledge of trout fishery management. He is author of a book, *Trout Fisheries in New Zealand, Their Development and Management* (Fisheries Bulletin No. 9, New Zealand Marine Department). . . . ¶**R. T. Wearne** of Wellington carries on the British tradition of the clergyman contributing to science as an enthusiastic amateur in his chosen natural history specialty — in his case, birds. He has made an intensive study of Cape Kidnappers' famous gannet colony. . . . ¶**V. J. Chapman,** M.A., Ph.D., Professor of Botany at the University College of Auckland, specializes in marine plant life and is a well known coservationist. He has a Cambridge doctorate and held a Henry Fellowship at Harvard; he has written a book on *Seaweeds and Their Uses* (Methuen, London, 1950). . . . ¶Our correspondent and editorialist **Thane Riney,** who dug out these data on our modest authors, is a biologist and ecologist with the Wildlife Division of the New Zealand Department of Internal Affairs. He is an experienced wild animal and bird photographer. D.G.K.

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THE COVER COPY

MAORI ARTISTS are among the world's best with a carving tool. The ancestral figure of wood was photographed by Toshio Asaeda of the Academy staff, courtesy of the M. H. de Young Memorial Museum, San Francisco. For the three greenstone *tikis* we are indebted to the Peabody Museum of Salem.

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EDITORIAL

SCIENCE ACROSS THE PACIFIC

NEW ZEALANDERS returning from the United States frequently remark, among other things, that they found few Americans who seemed to know much about New Zealand, and that what they did know was not necessarily true. It is likely that the man on the street in San Francisco or New York simply links New Zealand vaguely with Australia, somewhere in the South Pacific. And it is my guess that the most to be expected of well informed Americans who haven't been here is to know generally New Zealand's location; that it is a young and vigorous country which has experimented boldly with social legislation; that long before Tasman discovered it in 1642 and Cook rediscovered it in 1769 its two big islands had been found and settled by an intelligent, warlike, and sometimes cannibalistic people, the Maori, who came there in great canoes from Polynesian islands to the north.

The authoritative articles by New Zealanders in this special issue will increase general knowledge and enrich it with much detail; the Reviews offer many suggestions for further reading. My own contribution to the symposium, mainly reflections on the conditions of biological research and various other aspects of natural history in New Zealand, through the eyes of an American now several years at work here, has but one intent – greater mutual understanding and the increase of reciprocal relations across the wide Pacific.

Today the land looks vigorous. Most of the lowland areas have been cleared to support a highly productive pastoral economy, but the bush reclaims many marginal lands at the least chance – the youthful land yields slowly. For this reason the main effort of biological research has been in agriculture, with significant results. Research in many other fields is largely in early stages; the contributors to this issue are in their several ways pioneering on that frontier.

It is likely that few Americans, even those working in specialized fields, will appreciate the extent to which many scientists throughout the world are handicapped through isolation and lack of easy exchange of ideas with their fellows in other countries or even in their own. Until recently there were few professional biologists in New Zealand able to pursue special studies with enough concentration to maintain close contact with specialists elsewhere. In research it is vital to know what others are doing, through "the literature" and correspondence. Research time has unfortunately come second to the burden of teaching and administration which in New Zealand universities and government agencies has grown faster than the number of people qualified to deal with it.

In a country like New Zealand, the differences in background training and the lack of opportunities for communication are noticeable. The geographical isolation is obvious and understandable. New Zealanders themselves are keenly aware of the problem, and their scientific workers are making every effort to establish and maintain contacts with fellow workers in other parts of the world.

It is natural in a young country whose library facilities, in common with most other facets of the national enterprise, are in a growing stage, for growth to conform to a pattern characteristic of most vertebrates in being heterogonic – that is, it does not proceed at the same rate in all parts. For example, in zoölogical work it is natural that first concerns should be with description, identification, and distribution of the native species, and with the slow task of building up comparative reference collections in museums and universities. A glance over the titles of theses submitted for masters' degrees shows the most concern over life history studies of invertebrates, or taxonomic questions concerning them. Studies of the native land birds are in an early stage; in fact, there is still a strong need for a basic guide to accurate field identification of the birds of New Zealand. Even the fundamental facts of the life of the national bird, the kiwi, have yet to be learned.

The inevitable future exploitation of many wonderfully unique study opportunities within New Zealand will be welcomed by students of vertebrate populations, wherever they are.

Research is only one of the many activities that bring together people from different countries. I am optimistic enough to feel that it is only a matter of time and plenty of hard work before we find a vastly improved understanding between New Zealand's and America's natural history workers, who certainly have a great deal more in common than their language and the fact that pectoral sandpipers, sanderlings, bar-tailed godwits, Pacific golden plover, or knots can occasionally be seen along both our respective Pacific coasts.

The recent New Zealand sojourn of the Danish research vessel *Galathea* is a good example of coöperation in natural science, for in the words of Dr. Bruun, leader of the expedition, "All the shells, mussels, and snails found in New Zealand coastal waters will be left here for study by the New Zealanders who went on the trip. . . . Duplicate specimens will eventually go to Denmark. . . . Duplicates of other specimens will be sent to the Dominion from Denmark after the scientists have written reports on them. . . . Everywhere we have followed the policy of exchange – it is one of the international aspects of science – there are no atomic secrets about us."

As every research worker knows, there is only one language – the language of observing, questioning, thinking, and always the excitement and satisfaction of discovering a little more understanding. Each group in every country supplies a certain proportion of research workers who must by the very nature of their activities deal on this common ground with others spatially isolated from them. Coöperation inevitably continues, for as surely as marsupials are clearly separable but linked with other mammals phylogenetically, the activities of naturalists are usually intimately connected with and often dependent upon the work of naturalists in other countries. A growing reciprocity is not just optimistic theory; it is an ideal, yes, but a going one with a practical working basis. T.R.

'A LARGE LAND, UPLIFTED HIGH'

D. W. MCKENZIE

NEW ZEALAND's people may have a certain uniformity, but a great diversity marks the land they live on. Mountain and plain, volcano and lake, glacier and tree-fern, fiord and sand dune lie so close together as to draw an envious sigh from the visiting geographer, who sees within a day's run a dozen strongly marked land forms it would take him weeks to find anywhere else. The New Zealander is never away from a feeling of the opportunities and the difficulties his physical environment offers him.

New Zealand is geologically young. The mountain building which broke it into blocks and warped and uplifted them is still in progress, as frequent earthquakes testify. The great breaks in the rocks which are associated with the earthquakes seam the hills of the middle districts of New Zealand. The general line of the margin of the mountain blocks is northeast to southwest in the main mountain chains of both islands from East Cape to Central Otago. The North Island's mountains are both lower and narrower than those in the South Island, where the magnificent chain of the Southern Alps culminates in 12,349-foot Mt. Cook (our highest summit). Further south the trend lines curve eastward in the mosaic of depressed, tilted, or uplifted blocks which make up Central Otago. The northern part of the North Island has a different line in its structure. Its northwest lineation meets the northeast lines of the main mountain masses in the Volcanic Plateau of the North Island. Whether one set of lines curves into the other, or whether there is a sharper junction, is still a matter of dispute.

On the flanks of the mountain masses, or trapped in the blocks which make them, lie the lowlands; they are small and discontinuous. Only in the Manawatu Lowland, the Canterbury Plains, and part of the Southland Plains is there any continuous extent of flat land. The wide separation of the easily settled lands led to the inter-provincial rivalry which was evident in the early history of the country and is not yet dead. On the hilly land the soils are generally immature and tend to be leached; it is not to their richness that New Zealand owes its farming preëminence, but to climate.

Though the rugged relief of the country gives in detail a complex climatological pattern, in general it may be said that rainfall varies from adequate to abundant, sunshine hours are exceptionally high considering the rainfall; temperature ranges, both daily and yearly, are low; and climatic conditions are reliable. The result is an essentially forest climate (although it has also been called Mediterranean by some because of the absence of extremes in the maritime lowlands).

Almost the whole of the North Island, and the western half of the South Island, carried forest, either of the dense, overgrown rain-forest type, or the more open beech forest. The transformation of forest to grassland, especially in the North Island, was a great achievement. The forest, however, still stands in wait. If the hill country farmer overstocks or fails to topdress his grass, the invasion of pasture by native pig fern and shrubby tree manuka or the introduced gorse — all forerunners of the forest — soon mark the deterioration of his land. In such circumstances, with labor unavailable, the farmer turns to the airplane to distribute fertilizer. Aerial topdressing is now a major industry, spreading by light plane not only fertilizer but grass seed and rabbit poison.

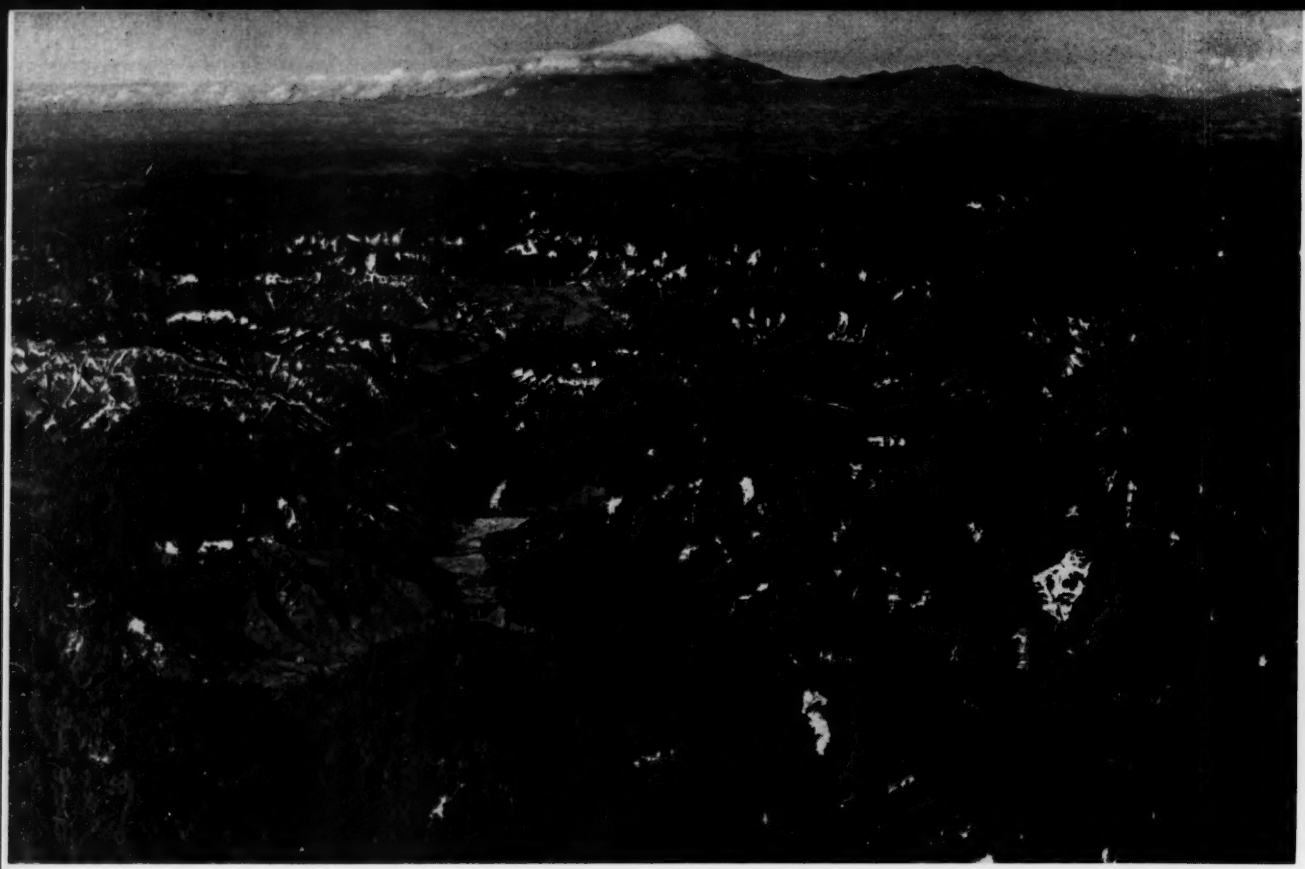
New Zealand's population is already two million and growing fast. To retain the great export surplusses of wool, mutton, and dairy produce on which its economy is based, the country looks to improvement in farming techniques to raise production. Little new land is available; indeed, much hill land unwisely torn from the forest has now gone out of use. In the forefront of development in the use of grassland, New Zealand is determined to retain both its trade and its high standard of living.

Photo credits, pages 3-7: **1,3,6,8,10, V. C. Browne (copyright); 4,7,9, Whites Aviation Ltd. (copyright); 5, New Zealand Aerial Mapping; 2, no credit line given. *PD's* thanks to all who kindly permitted us to use their copyright photographs in this special issue. *See map, inside back cover, for location of these aerial views.***

1

1. Bay of Islands, east coast of Northland, on the North Auckland Peninsula — drowned harbors, home of big-game fishing launches; highly variable, largely volcanic soils, mild climate, once forested with kauri, now marked by agricultural progress, especially in dairying. *2.* Marlborough Sounds in Cook Strait, north end of the South Island — deeply drowned river valleys; a favorite holiday resort of New Zealanders.

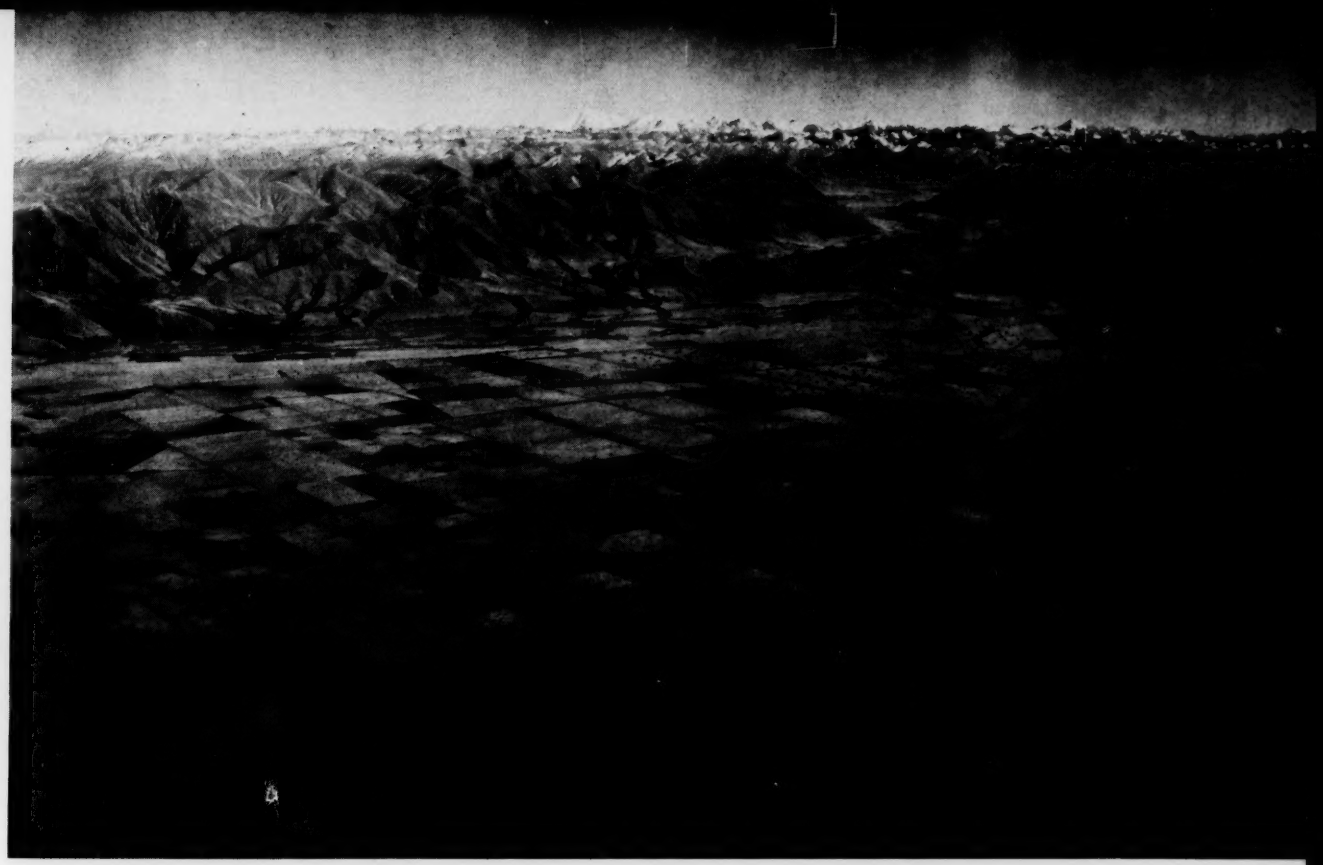
2



3

3. Looking west to Mt. Egmont — wooded ridges characteristic of the North Island. *4.* Mt. Egmont to the west across the Taranaki Ring Plain (the Tasman Sea is beyond) — around this extinct volcano is one of the world's densest populations of dairy cattle. Eltham, with one main shopping street, shows tendency of New Zealand towns to spread widely, with so much land to each house. The close-set farms are typical.

4



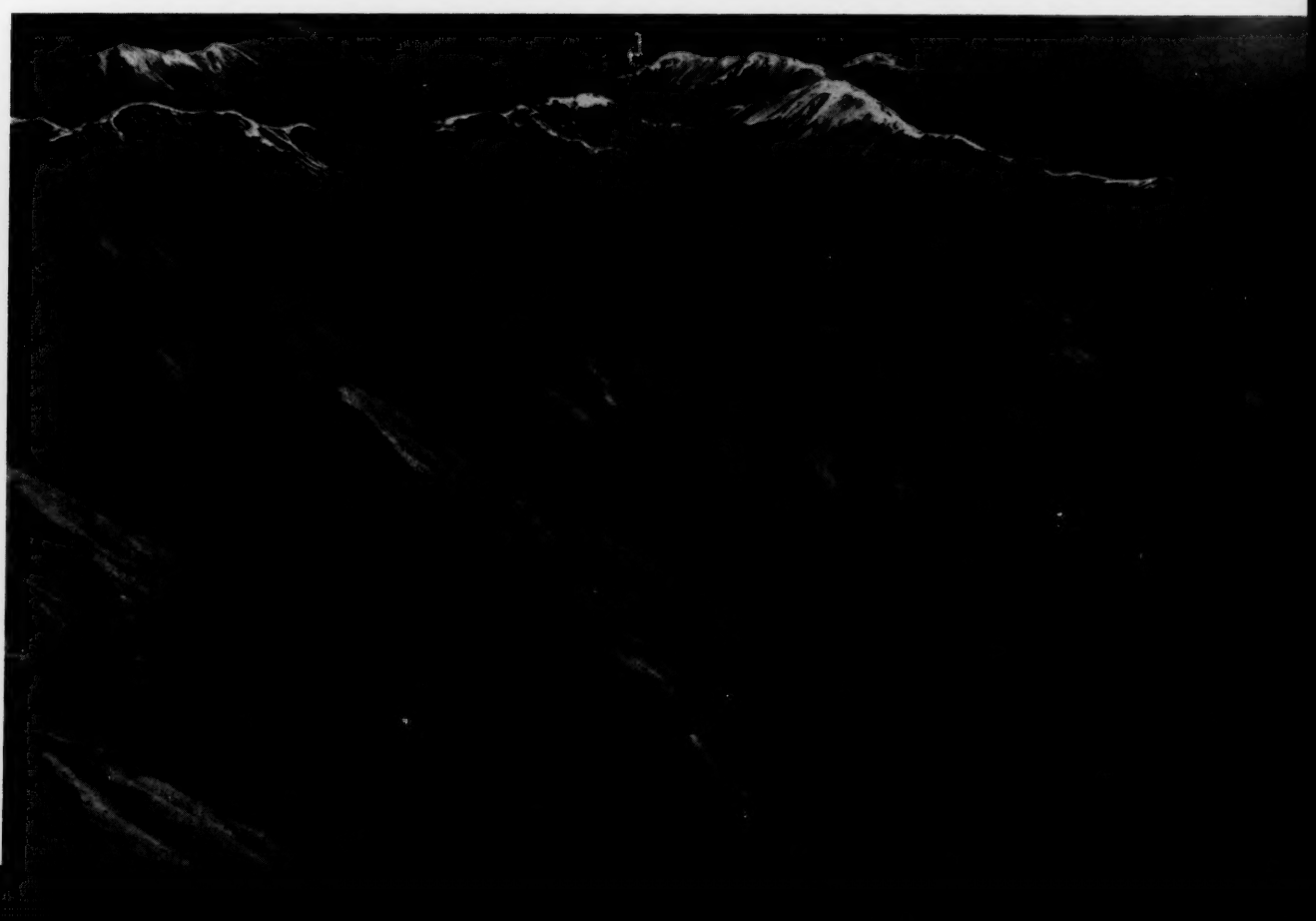
3

5

5. **The Southern Alps, topped by Aorangi the "Sky Piercer" (Mt. Cook), lie midway along the west side of the South Island. The east-flowing rivers have built great delta fans. Arable farming covers the Canterbury Plains, sheep farming the high foothill country in the middle distance.** *6.* **Close-up of the rugged tussock grassland country, northeast South Island. Nearly destroyed by too many sheep, it is being rehabilitated.**

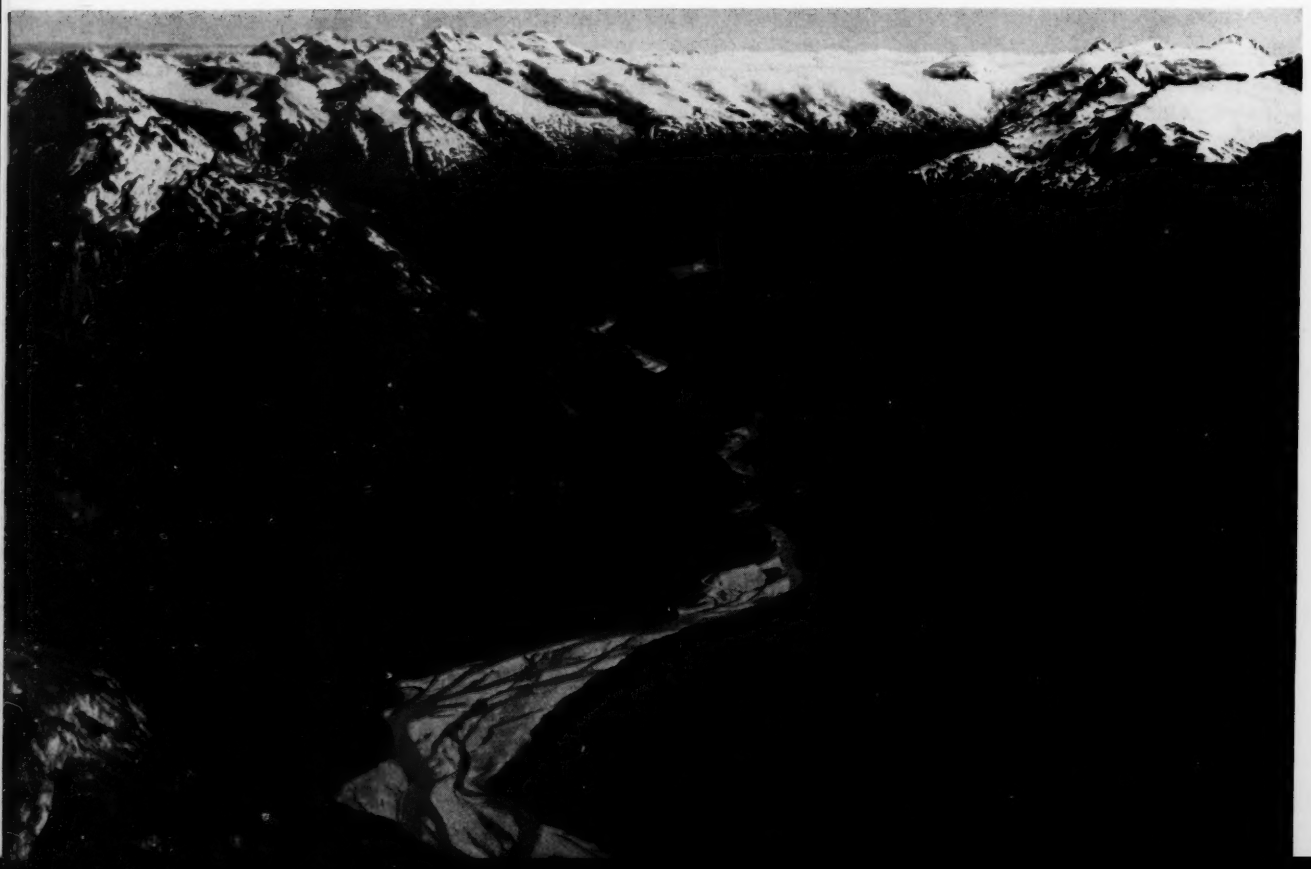
4

6



7

7. **Hills of eastern Otago — sheep land; a dissected plateau where faulted and warped blocks and depressions swing southwest from the central mountains of the South Island.** *8.* **Beech forests, characteristic of much of the South Island, in the valley of the Dart River. Unlike the North Island rain forests, these will regenerate in the present climate when introduced deer, goats, and opossums are held in balance.**



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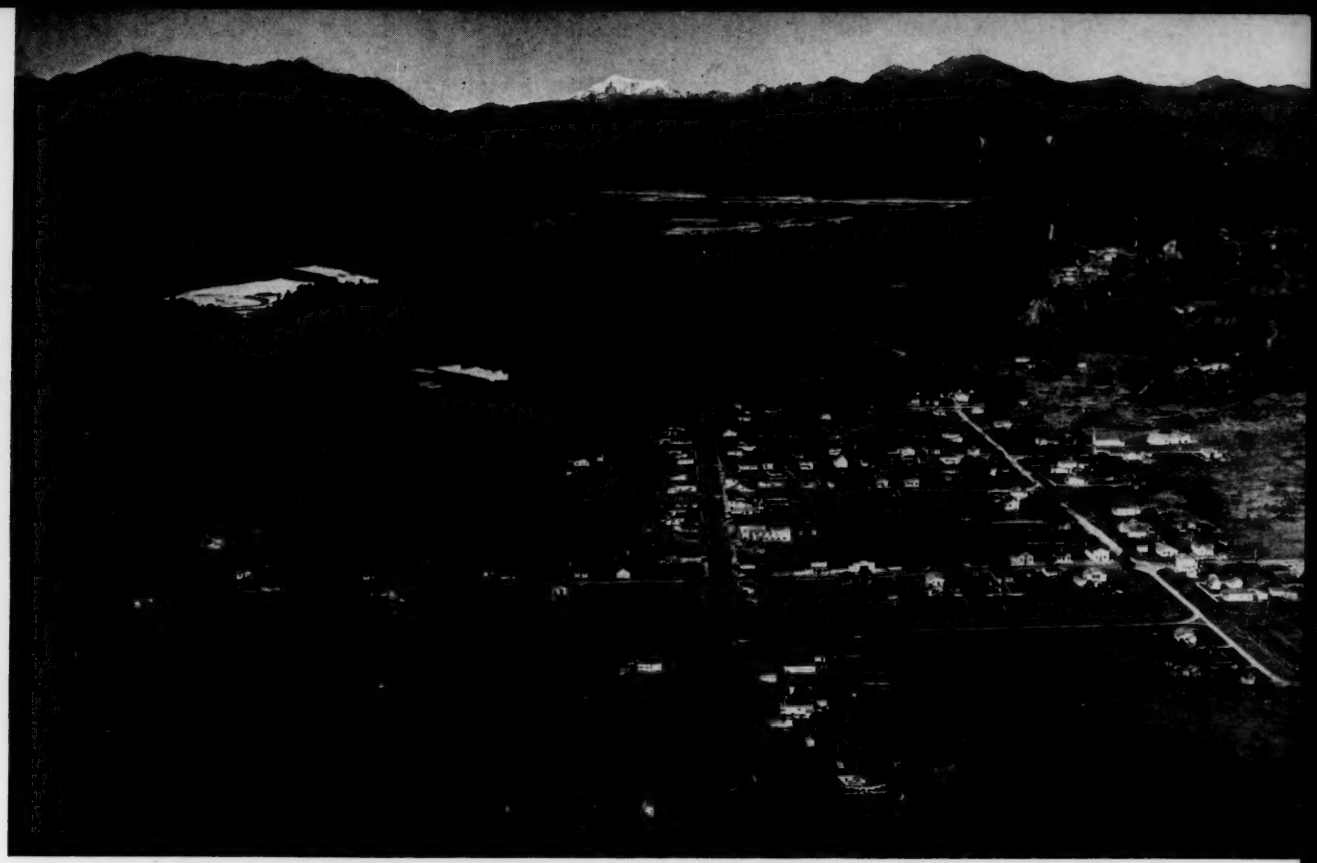


9

9. **The narrow coastal plain of Westland lies along the Tasman Sea against the Southern Alps. In gold-rush days this little town had 80 hotels; now sawmilling keeps it alive. Coal and timber are Westland's wealth now although alluvial gold is still washed out of gravel terraces.** *10.* **The head of Doubtful Sound, Fiordland — the magnificent drowned glacial valleys, not fully explored, are a South Island tourist paradise.**

10

FLYING MAMMALS & BIRDS WITHOUT WINGS

HOW DID NEW ZEALAND GET ITS STRANGE FAUNA?

R. A. FALLA

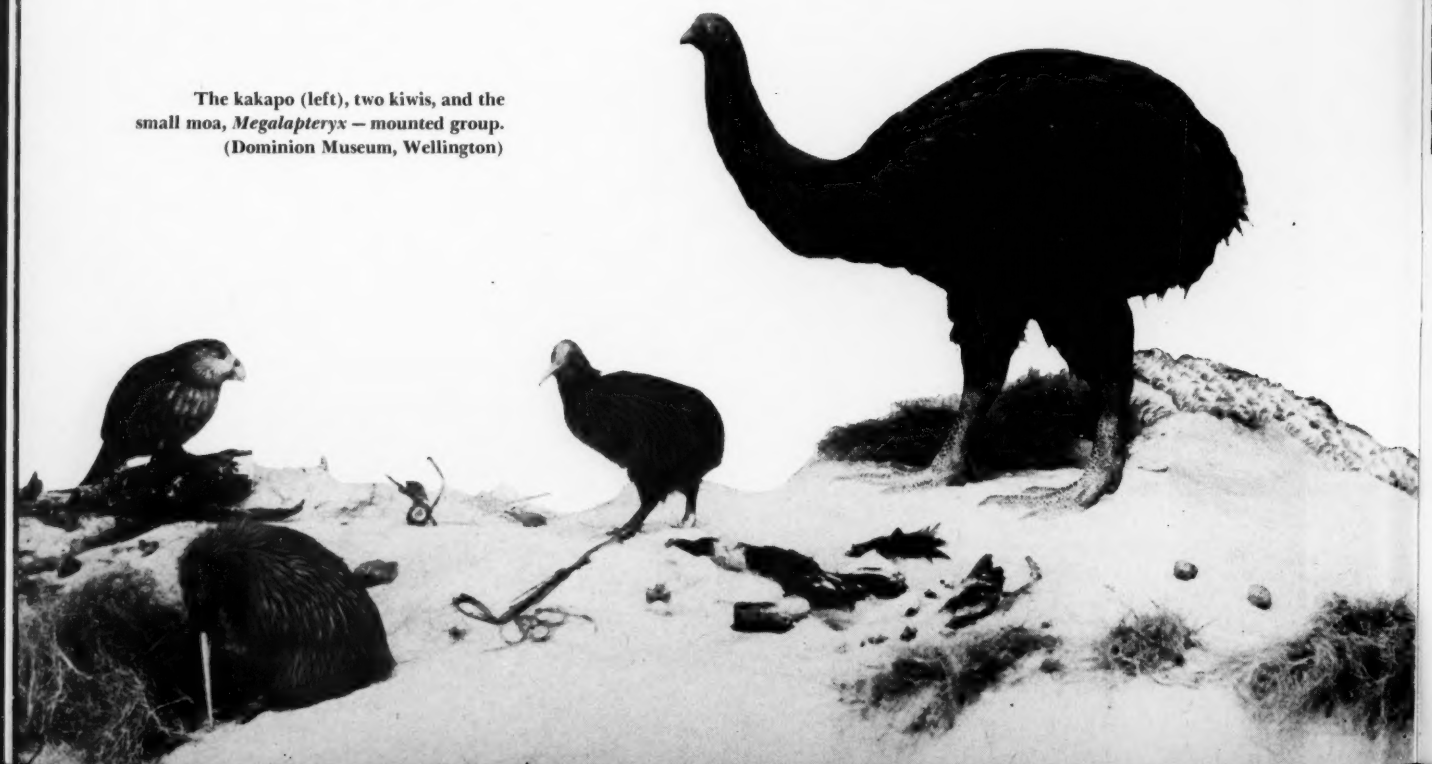
ONE of the popular pastimes of naturalists a generation ago was speculation on the origins of floras and faunas in different parts of the world. This followed the descriptive era in which constituent plants and animals were listed and named, and one of its commonest features was the hypothetical postulation of land bridges. As a field of study it has remained interesting but unproductive; and it seems likely that the revival of direct study of plants and animals in their present environment, and especially the ecological aspects of that study, will prove more rewarding.

It was customary to regard the native fauna of New Zealand, with its paucity of vertebrates except for birds, and its high percentage of endemic forms, as a relict fauna of great antiquity cut off from land connection before the rise and spread of mammals. It is, however, quite likely that the endemic features owe their distinctiveness to the rapid modification of small and random units of population which found themselves drifted into an isolated environment, not only varied in character but subject to comparatively rapid change of climate and surface features. There is so much indication that some phases of this process are still going on that a new and real value attaches to field work using all the established technique of the old-fashioned naturalist and an analysis that makes use of the newer concepts generally grouped under the heading of ecology.

The most important single influence on the New Zealand biota probably is the oceanic environment. There is a relatively unstable atmospheric convergence between tropical and antarctic weather cycles which produces direct effects on rainfall and prevalence of winds; and there is a slightly more stable or at least more slowly changing meeting ground of bodies of sea-water forming the sub-tropical convergence which is modified in shape by the strong influence of cold and warm currents from several directions. This has such a direct effect on the climate of today that one could readily imagine even slight changes in intensity and direction in the past as having produced very different climatic conditions. The effect on the fauna alone is and has been one of fairly rapid change in composition; and there is evidence of quite recent extinction of many forms in the process. The condition of other large insular areas of the Southern Hemisphere has been noted as presenting similar features in this respect.

Paleontologists in New Zealand work for the most part with horizons of marine origin, and very few of the fossils of terrestrial origin can be definitely dated much earlier than the Pleistocene era. The quite considerable deposits of bones of extinct birds, including those of the giant *moas* and their relatives, along with those of the still surviving reptile *Sphenodon*, are of sub-Recent to Recent origin.

The main constituents of the ancient bird fauna are:



The kakapo (left), two kiwis, and the small moa, *Megalapteryx* — mounted group. (Dominion Museum, Wellington)

gallinules, rails, and geese, nearly all short-winged and flightless; the more anomalous kiwis *(Apteryx)*, which still survive; and the giants of the Moa family with such extreme wing reduction that their phylogenetic origin is obscured by the lack of character in the several vestigial parts of the skeleton.

The evidence built up from the study of remarkably well preserved remains suggests populations of birds surviving in savannah or scrubland environment and adapted to feeding extensively on grasses. It is not quite clear whether the numerous waterfowl were contemporary, but they may well have been so, especially in rapidly changing coastal areas. The contemporary bird inhabitants of the forested areas of those days have for the most part survived, or they have become rare only during the period of European settlement and the rough adjustment brought about by felling, firing, and the introduction of rodents, and later of browsing and grazing mammals, into the remaining forests.

In approaching a study of the present-day fauna, this historical perspective, even if hypothetical in places, is useful. Today, a large section of the country has been altered by agricultural and pastoral development and by the requirements of mining, lumbering, and power schemes. The composition of flora and fauna reappearing on such areas can never be an identical regeneration, and numerous exotics form part of the new associations. Birds of European, North American, Asiatic, and Australian origin have been successfully "acclimatized" and it is a fair guess that they are numerically now more abundant as a group than the total of individuals of indigenous species. Some of the changing conditions on the larger main islands of New Zealand have been adverse for certain indigenous species which now survive only on the small but numerous outlying islets which, luckily, were unsuitable for profitable cultivation. Many of these have been reserved for the preservation of their flora and fauna, and the success of an island sanctuary policy has been notable.

↑ Rockhopper penguins *(Eudyptes cristatus)* on parade, at Campbell Island, an eight by ten-mile possession about 380 miles due south of New Zealand's mainland. (E. F. Doley)

← Little blue penguin *(Eudyptula minor)*, found commonly along the coasts of both the North and the South Islands of New Zealand. (Thane Riney)

The factors that have selectively thinned out the native fauna are not fully understood, but a study of the elements that still survive on certain smaller islands does provide some clues. The tuatara *(Sphenodon)*, for example, represented on the main islands only by skeletal remains, is abundant on about a dozen outliers of the North Island. Some of them are arid, sparsely vegetated, and have the loose rock and soil of their surfaces honeycombed with nesting petrels. To all these conditions the reptiles are adapted; indeed, the association with nesting petrels is almost symbiotic. It is at least mutually accommodating. The birds' burrows provide shade, shelter, and, doubtless, some warmth, as well as an undisturbed place for the winter hibernation of the tuatara. Even in the crowded summer season the tuataras are out on nocturnal forage at the times when the birds are most active in the

← The egret *(Egretta alba modesta)* in New Zealand tree fern setting. → Typical small insectivorous birds of the forest, yellow-breasted "tits" (flycatcher genus *Petroica*). (National Publicity Studios)

part of the North Island and that anomalous outlyer of the South Island, Stephen Island, have a patchwork distribution on steep mountain ranges separated by areas of cultivated lowland.

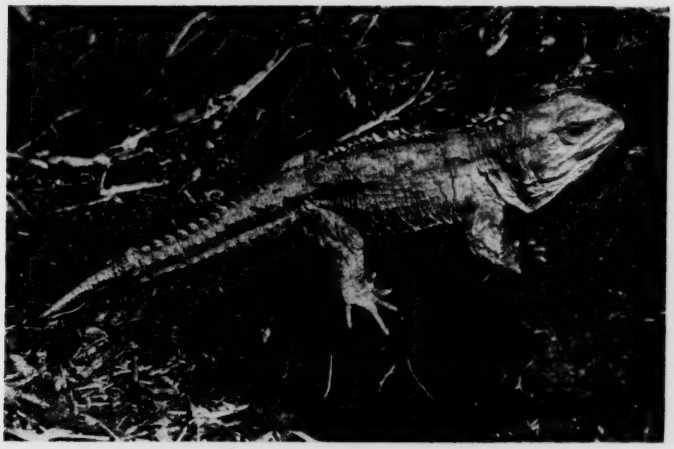
That the same process of shrinking habitat has affected many birds is clear from the known distribution of their sub-fossil remains. The flightless rails, gallinules, and ducks, along with the moas, seem to have become extinct in the North Island earlier than in the South Island. The final stages of extinction in the South Island were in fact so recent that evidence for the survival of one of the smaller moas *(Megalapteryx)* until the year 1840 or later is quite credible. At least two other flightless birds, the large owl-parrot or kakapo and the giant waterhen or takahe *(Notornis)*, formerly common over both islands, are still found in precariously small numbers in localities in the south and west of the South Island. The re-discovery of *Notornis* in 1948 by Dr. G. B. Orbell has stimulated a new scientific interest in all the features of the habitat in which the birds survive. They have been found in intermontane valleys and the connecting lower saddles of high country (2,000-4,000 feet) west of Lake Te Anau. It is on the eastern and drier side of an area of high rainfall and the vegetation consists of patches of rank snow-grass *(Danthonia* spp.) and low coarse scrub adjacent to forests of southern beech *(Nothofagus* spp.). The summer and nesting haunts of the birds are mainly the snow-grass areas and they are almost completely grain-eating. The even more bulky moas seem to have required herbage and leafy food in corresponding proportion and must have exerted a

burrow with both breeding partners present or young being fed. The food of the tuatara, mainly insects, is not required in great quantity even in summer, and hardly at all in winter. The point at which the tuatara is most vulnerable is in its habit of burying its eggs in a shallow trench for the long incubation period of more than a year. In considering possible exterminators it is hardly necessary to go beyond the omnivorous pig, though the ravages of the Norway rat and black rat were probably more significant in the initial reduction. The surviving tuatara sanctuaries at any rate are free of rats, except that the little rat *(Rattus exulans)* does exist on some of them.

In addition to those representatives of the ancient vertebrate fauna that have persisted on island sanctuaries, there are others whose range on the main land masses has been reduced to "pockets of survival." New Zealand's only native mammals, two small bats of different genera *(Mystacops* and *Chalinobus)* have now a discontinuous distribution and are rare. The native frogs also (genus *Leiopelma)* inhabiting the northern

The giant waterhen, takahe of the Maori *(Notornis)* in the snow-grass of its summer nesting grounds in Southland. (Thane Riney)

Adult and young wekas *(Gallirallus)*. (Nat. Pub. Studios)



Tuatara *(Sphenodon)* near its burrow on one of the outlying islands. (Dominion Museum)

The kea, a parrot, lives along the high ranges of the South Island. (T. Riney)

The female kiwi has a characteristically long bill. This is a mounted bird. (C. Hale, Dominion Museum)

browsing and grazing pressure comparable with that of mammals elsewhere. The kakapo in its heyday levied its toll of grasses by chewing with its heavy parrot bill and spitting out the spent fiber.

There are some exceptions to the tale of shrinking habitat suitable for the members of the ancient avian fauna. Kiwis of all species persist in surprising numbers on the three main islands. They are nocturnal, elusive, and cryptic to such an extent that they are seldom seen, and the only significant study made of their habits has been done on captive birds. Another exception is the extraordinary mountain parrot, the kea, a bird hardly known to early naturalists, which in a century has extended its range along the whole mountain system of the South Island from south to north. Its much publicized habit of sheep-killing, which is a by-product of an over-developed propensity for gang mischief, is a relatively unimportant aspect of its natural history, though of practical concern to sheepmen. To meet the problem, the usual costly method of indiscriminate bounty and persecution has been applied; but it is deserving of more discriminating study, for the incidence of sheep-killing is sporadic and unpredictable, and in some areas inhabited by keas and sheep has never occurred.

The process of natural invasion and infiltration of new elements in the avifauna still goes on and a vigorous section is composed of birds of near-Australian affinities which are still in process of extending their range and adapting themselves. Insectivorous small birds are well represented in this group, flycatchers of several genera and the ubiquitous wax-eye *(Zosterops lateralis)* credited with having made its initial mass appearance in New Zealand as late as 1856. Amongst ducks the strongly endemic genera are rare and restricted. The most distinctive of them, the blue or mountain duck *(Hymenolaimus)* inhabits the stony upper reaches of mountain streams; but the populations of surface-feeding ducks, notably the grey *(Anas superciliosa)*, are still vigorous enough to provide legalized hunting in season. The extension of breeding distribution to New Zealand of some Australian herons, spoonbills, and a plover *(Lobibyx)*, has taken place within the last fifty years. Egrets, not readily separable from the Indo-Australian egret *(Egretta alba modesta)*, have long been established, but they are seemingly able to breed in only one or two sheltered localities. There seems little doubt that the limiting factor to increase of such birds is the prevalence of high winds; and it may be for the same reason that the migrant swifts and swallows so common in Australia reach New Zealand only in sporadic and exhausted waves and have not yet become established as regular visitors. One of the introductions from Australia by human agency, the black swan, is now exceedingly abundant on the inland waterways and estuaries, thus restoring in part one of the elements of the ancient avifauna, a slightly larger swan which became extinct before European settlement.

In swamps and marshes the indigenous ducks, bitterns, gallinules, and rails are found in about the same proportion and variety as in similar habitat in other parts of the world. Birds of prey are not well represented; besides an eagle now extinct there is one species of harrier and one falcon. Of two owls the larger *(Sceloglaux)* is almost extinct, and the smaller *(Ninox)* is common. However, in the rich and varied forests there is a distinctive assortment of "bush birds." A heavy, bright plumaged fruit pigeon was formerly very abundant and is still quite common. Feeding largely on the fleshy fruits of many forest trees, it was and is no doubt a significant factor in seed dispersal. A lively brown parrot nearly as large as the pigeon has become rare, and three species of parakeets have also diminished in numbers. In general, birds that nested in holes in trees or habitually fed on the ground have suffered most from the invasion of predators and competitors. Three widely divergent but related wattlebirds, the huia, the saddleback and the kokako have, with the exception of the last, almost disappeared from the mainland.

Insectivorous small birds have been less disturbed and there are plenty of flycatchers, masquerading locally under such names as "tomtits" and "warblers," in all the wooded areas. Song in this group is well-developed and melodious to a high degree. Exceptionally fine song is also characteristic of the endemic New Zealand representatives of the Australian honeyeaters. The tui and the bell-bird can be seen and heard in all parts of the country, being equally at home in plantations and garden shrubberies as in the native forest. Another endemic family, but songless and almost voiceless, is that of the New Zealand wrens *(Xenicidae)*. The several species form an interesting pattern of distribution, each being found in characteristic habitat and life zones from lowland forest to the bare rocky faces of the South Island mountains.

Compared with conditions found on most continents, bird life in New Zealand in spite of its outstanding oddities, can hardly be described as rich and varied; and there are no spectacular mass migratory movements except of shore birds for which New Zealand is the southern terminal for a number of Arctic-breeding species. However, the reverse is true for oceanic birds and seabirds generally. Albatrosses and petrels, marine cormorants, and penguins, are present in rich variety of speciation and spectacular concentration of numbers. This is especially true of the subantarctic area from Stewart Island south to Campbell and Macquarie. Here the impact of man has been less marked, and although much of the surface of the subantarctic islands has been modified the oceanic bird life using them as breeding stations has remained comparatively undisturbed.

THE ANGRY MOUNTAINS:

NEW ZEALAND'S VOLCANIC BELT

G. C. SHAW

FEW NEW ZEALANDERS will forget the sad Christmas of 1953. They had that week welcomed their Queen, Elizabeth II, to Auckland City. A few hours before her eagerly awaited Christmas day broadcast to the Empire listeners were stunned by tragic radio bulletins. An express train traveling to Auckland by night across the lonely volcanic plateau had crashed into the Wangaehu, a small river draining the slopes of ice-capped Ruapehu volcano. More than one hundred and thirty passengers had drowned in a torrent of silt and boulder - laden water. The bridge was wrecked, huge concrete pylons were tumbled over, and railway coaches were swept far downstream. There seemed to be no explanation of the sudden fierce torrent of water. Several days elapsed before observers flying over Raupehu saw a deep gash at the head of the Wangaehu River immediately below the summit crater lake. A natural tunnel in the ice-rock wall bounding the lake had collapsed, allowing the terrible debris-laden flood to surge down the river a few minutes before the night-train passed. This was the latest and most tragic of disasters attributable to New Zealand's volcanoes.

Fortunately such disasters have been rare. All recent eruptions including the tremendous Tarawera explosion of 1886 have occurred in thinly populated areas. The lava flows which cause havoc in other countries are almost unknown here. But there is a danger that destructive eruptions may some day occur on the volcanic belt of the North Island.

All New Zealand's active volcanoes and several extinct ones are found along a volcanic belt which stretches northwest across the center of the North Island. From this belt moderate-depth earthquakes (down to 200 miles) are recorded. Here, as in other parts of the world, there is a relationship between the distribution of active volcanoes and of moderate - depth earthquakes. On this narrow belt stand the National Park volcanoes, three great piles of ash and andesitic lava towering above the broad central volcanic plateau of the North Island. They grew vigorously during the Ice Age, but present eruptions add little to their size.

Ruapehu (9,125 ft.), the largest of these volcanoes, has a broad irregular summit buried beneath an ice-field and small glaciers. Set in the midst of the ice is a warm crater-lake 600 yards in diameter. The mountain is built of lava and ash erupted not from one but from several craters, most of them now hidden by the ice. Early observers thought that the mountain had had its top blown off by explosions. Although from a distance it is tempting to picture the gentle concave slopes extending high above the present summit to form a cone, it is unlikely that the suggestion is true. The mountain has seen little constructive activity for many tohusands of years and its shape has been slowly altered by erosion. Small Ice-Age glaciers ate back into its summit and streams fed by rain and melting snow have carved deep gorges in its flanks, exposing the layers of lava, scoria and ash of which it is built. The 1945 eruption which lasted for nearly a year was the first witnessed at Ruapehu. Overflows from the crater lake similar to the one of Christmas 1953 had occurred a few times in the past century when the country was much more sparsely populated. These, and occasional steaming of the lake, were the only previous signs of activity.

The 1945 eruption of Ruapehu in the North Island volcanic belt began with steam rising from the crater lake as a plug of hot lava rose in the volcano's throat. The lava completely displaced the lake and filled the crater. (Aerial view, courtesy Royal New Zealand Air Force)

At the beginning of the eruption columns of steam rose from the lake as a plug of hot lava ascended the throat of the volcano. Soon the top of the lava-plug (tholoid) appeared as a small steaming island. Steam at high pressure escaped noisily from fissures in the surface of the lava, and rocks were hurled high into the air. The island disappeared, but six weeks later another took its place. This tholoid continued to grow, and within a month lava had entirely displaced the lake water. Rocks, steam, gases, and a small amount of ash were violently emitted. The red glow of hot rock could be plainly seen through cracks in the hard black crust, and at one time it seemed likely that the lava would spill over as a flow. Later a vent was blasted through the lava and from it were poured dense clouds of ash which blackened the mountain top and spread for many miles. Activity slowly diminished and the crater filled again with water. Centuries may pass before this old volcano can generate enough heat to disturb the solidified lava-plug and cause another eruption.

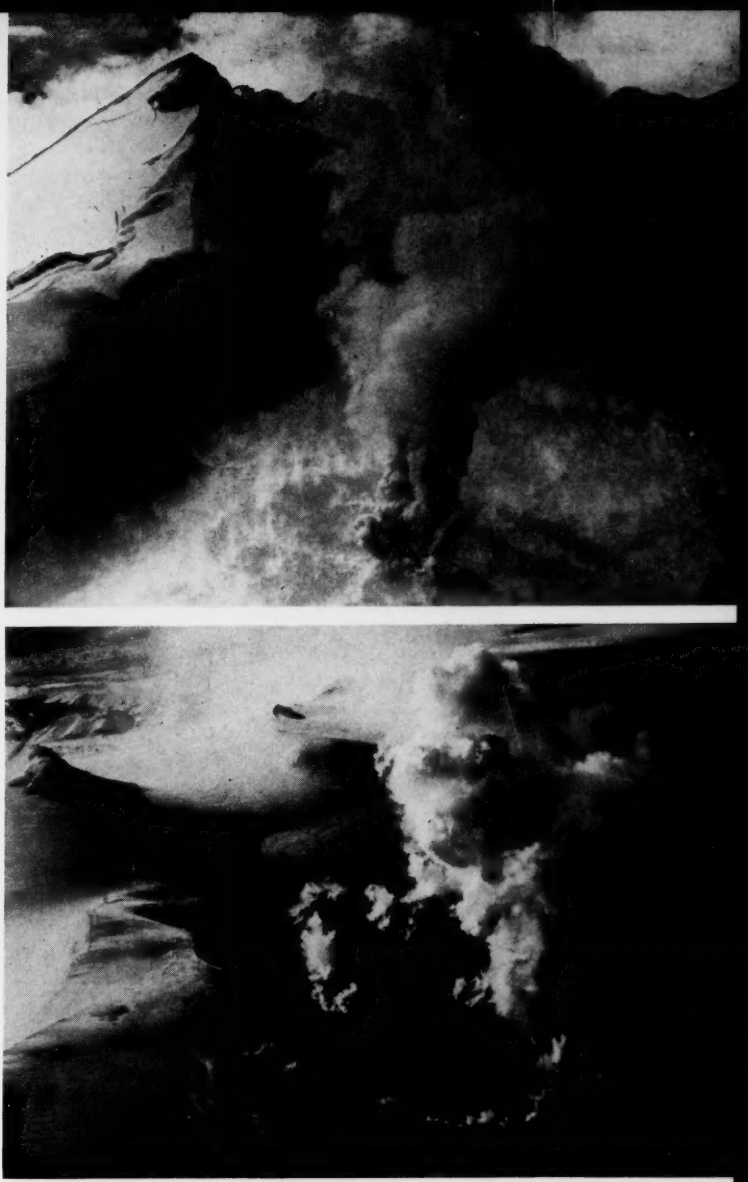
Ngauruhoe (7,515 ft.), Ruapehu's neighbor, is a smooth, symmetrical cone which erupts noisily every few years, sending up spectacular clouds of ash and steam. But apart from the emission of a lava-flow in 1949 it has never been seen to do any-

Ruapehu's crater lake filled again, to burst through its dam on Christmas Eve, 1953, and flood the Wangaehu River. At the right is one of the huge concrete bridge pylons which were dragged downstream by the torrent. Ruapehu is serene in the distance as rescue workers search for bodies from the wrecked passenger train. (Courtesy Photo News Ltd., Wellington)

Ruapehu, 1945, early stage: steam rises from the crater lake as the hot lava plug rises to make an island. Some ash has darkened the ice. (Courtesy N. Z. Government)

thing more violent than litter its slopes with boulders and dust the countryside with ash. The 1949 eruption was the biggest witnessed at Ngauruhoe; the first lava flow seen in New Zealand emerged then. The eruption lasted nearly a month. On the first day rocks and steam were ejected and numerous hot avalanches rushed down the mountainside. Soon a dome-shaped plug of lava was seen filling the crater. This spilled over as a mile-long lava flow, its surface covered with rough blocks of chilled lava crust. The volcano began to throw out clouds of ash, the interval between eruptive bursts lengthening from minutes to days. The eruption was soon over, but for several months the lava flow remained hot enough to melt snow. Ngauruhoe is a young volcano which has grown rapidly upon the wreckage of Tongariro, a much older and larger volcanic mass which has been partly destroyed. Tongariro is a volcano of complex structure which grew by eruptions from a number of separate vents, several of which still show mild activity.

New Zealand's active volcanoes, geysers, and hot springs are found on the central volcanic plateau of the North Island, a district which was the scene, from the Ice Age until quite recently, of prodigious eruptions and vast outpourings of pumice, ash, and lava. Some geologists believe that much of the ten thousand square miles of rhyolitic rock on the plateau was deposited not as lava flows and ash showers but by the accumulation and frequent consolidation and welding of shreds of hot volcanic glass poured out in tremendous *nuée ardente* eruptions. No eruption is more terrible than a *nuée ardente* — a huge glowing cloud of incandescent gas which races down a



Later: lava has completely displaced the water. Shortly afterwards a vent was blasted in the lava and the volcano emitted dark clouds of ash to blacken its top. (RNZAF)

slope carrying in suspension large quantities of semi-molten fragmentary rock. Such a cloud descended Mt. Pelée in Martinique in 1902, completely destroying the town of St. Pierre. Another *nuée ardente* at Katmai, Alaska, in 1912 filled the Valley of Ten Thousand Smokes with hot sand. American geologists have suggested a similar origin for the massive rhyolite rock of Yellowstone National Park.

The central volcanic plateau has been dissected

Steam at the base of the black triangle marks the point where the natural tunnel in the ice wall of Ruapehu's crater-lake collapsed, letting the water rush out to flood the Wangaehu and wreck the train. (RNZAF)

The Tarawera Rift of the great eruption of 1886 lies on the north margin of the Volcanic Plateau. One brief tremendous outburst tore this rift for nine miles across an unsuspecting countryside, scattering mud and volcanic ash over the land. (©Whites Aviation Ltd.)

by streams, warped, broken by great faults, and blanketed by ash showers. Volcanoes have grown above it and explosion craters and basins formed by warping and subsidence have filled, forming lakes of great beauty. Tourists from all over the world are drawn to the spectacular geysers and hot springs found in the long, downfaulted depression between Lake Taupo and Rotorua township. Rotorua is the center for visits to the thermal areas, which together with trout fishing, sailing, and deer stalking make it New Zealand's most important tourist and holiday resort. Greatest of the attractions is Rotorua's Whakarewarewa village where fumaroles, boiling mud pools, and hot springs abound. Many of the geysers are small, but Pohutu, the largest, has a height of 60 feet, a size comparable with Old Faithful geyser at Yellowstone which throws water a hundred feet in the air. Many native Maoris live at Whakare-

Tarawera, 1886, soon after the eruption. Foreground: deep craters were blasted through the hard rhyolite of the mountain. Beyond, a great steaming basin was blown in soft ground at the foot of the peak. This depression has since filled to form Lake Rotomahana. (Historic photograph, courtesy Dominion Museum, Wellington)

Waimangu, largest geyser ever known, erupted explosively every 36 hours from 1900 to 1904. Mud, rocks, and water were hurled over 1,000 feet high. (Dominion Museum)

warewa, bathing and washing in the warm streams and cooking their food at the steam jets and in boiling pools. Although they have adopted the dress and habits of the white man they are, at Whakarewarewa, independent of his plumbing.

Visitors to Rotorua are often alarmed by the trembling ground and the sight of steam rising quietly by the roadside or from suburban gardens. But the town has known danger only once. Elderly citizens still recount the terrors and suspense of a night in June, 1886, when Tarawera Mountain, thirteen miles away, burst into eruption. Although Rotorua escaped serious damage, in villages near the mountain 130 people, mostly Maoris, were killed. Tarawera erupted without warning. About one o'clock in the morning sleepers were awakened by earthquake shocks which continued, until at 1:30 A.M. the northernmost end of Tarawera erupted with a vivid flash. The explosions spread quickly along the summit and within an hour the whole mountain top was in violent activity. Eye witnesses at Te Wairoa, a village six miles from the mountain, described tremendous flames shooting a thousand feet while showers of fireballs fell all around setting fire to forests and villages. An immense black cloud with vivid flashes of lightning rose from the mountain and moved toward Te Wairoa. Scoria and rocks fell thickly, burying and breaking down the houses and native huts. The worst of the outbreak was over by morning. The eruptions had traveled a straight line blasting a nine-mile chain of craters across the mountain top, through Lake Rotomahana, and along the Waimangu Valley. The famous Pink and White Terraces were blown to fragments and the land for miles around was buried by scoria from

Ngauruhoe (7,515 feet) from the grounds of the Chateau Tongariro, a tourist hotel at the foot of Mt. Ruapehu. The hills to the left are part of the remnants of Tongariro volcano upon which Ngauruhoe has grown. The icy slopes of the National Park volcanoes are popular skiing grounds in winter. (New Zealand Government)

the mountain and mud from Lake Rotomahana. Many of the craters in the Waimangu Valley remained active for months, and diminished activity continues in them today. In 1900 the famous Waimangu geyser, largest in the world, began its activity in one of these craters. For four years it erupted explosively every thirty-six hours, throwing mud and water a thousand feet in the air. In 1917 all activity of the geyser ceased.

The Tarawera eruption was one of the greatest in world history. The mountain, forest covered and apparently extinct, lay on the volcanic belt. It is not known why the outbreak occurred when it did. Two interesting features of the eruption are unexplained. The mountain was built of rhyolite but the rock thrown out was basalt, a lava of entirely different composition. Basalt is normally produced quietly as mobile lava flows and scoria, but at Tarawera violent explosive eruptions distributed it far and wide as ash and fine scoria.

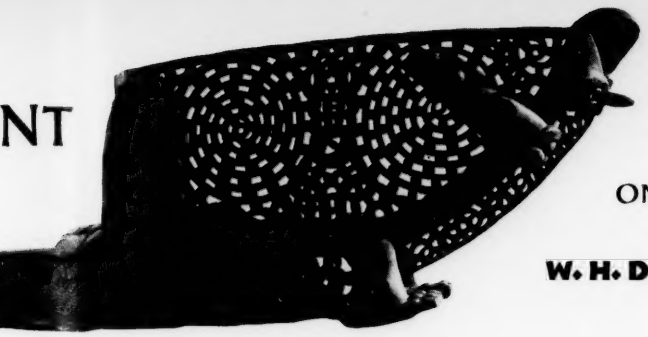
Northeast of Tarawera along the volcanic belt are two extinct volcanoes, Mt. Edgecumbe and Whale Island and beyond these, 30 miles to sea, is White Island, New Zealand's most dangerous volcano. This small island has a wide breached crater opening to the sea. The crater floor has many steam jets and roaring fumaroles at which temperatures up to 500° C. have been measured. several attempts have been made to mine the crater's rich deposits of sulfur, one of them ending in tragedy. In 1914 a volcanic mud flow swept into the sea the buildings, machinery, and the dozen sulfur workers. No witnesses survived, and the exact nature of the eruption can never be known. The track of the mudflow is marked by a field of conical hummocks of sand and rock.

There is everywhere geological evidence that New Zealand is a young, actively growing country. Frequent earth tremors are recorded and several disastrous earthquakes have occurred. The 1855 quake severely damaged Wellington and raised the harbor five feet. Napier harbor was raised and the township wrecked with great loss of life in 1931. Geologists from time to time find lines of scarplets marking recent movements along faults. Parts of New Zealand's coastline are bounded by flights of originally horizontal wave-cut platforms now elevated and buckled by earth movements. It is likely that volcanic activity associated with this youthful instability will continue for many millions of years, particularly in the volcanic belt of the North Island.

THE MAORI WENT

THE EARLIEST inhabitants of New Zealand, generally known as "moa-hunters," have left no evidence of actively hunting whales, but some of their ornaments show that they, like most Pacific races, collected the teeth from stranded sperm and killer whales as well as porpoises and dolphins. Sperm whales' teeth were highly valued and used as a central pendant in necklaces of bone reels. The importance of this central tooth is evident from the use of imitation teeth cut in serpentine stone and modeled accurately, even to the hollowing out of a root-like cavity at the end. One of these approximately 9 inches long and weighing over 1.5 pounds is known from the Wairau burials in the South Island, and many derivative forms that can be traced back to the whale tooth form are known.

During the landings of Maoris from the Fleet canoes of 1350, a dispute over a stranded sperm whale occurred between two of the canoes that came into the Bay of Plenty, the area that later became the main center of Maori whaling proper. The value attached to this whale as a source of food and teeth is clear from



NT

A-WHALING —AND BECAME

ONE OF THE WORLD'S BEST WHALEMEN

W. H. DAWBIN

the detailed account of the dispute which had been passed down by word of mouth in a number of tribes until finally recorded by Sir Peter Buck in 1949, and he records that of all the materials used for ornaments the one most prized throughout Polynesia was the teeth of the sperm whale. While it was often simply perforated at the base to use as a breast ornament, it was more generally shaped into various forms. In spite of the value attached to whales, there appears to have been no active pursuit by native techniques parallel to those once used by Eskimos, North American Indians or Japanese.

Active whaling by Maoris started only after the techniques had been learned from Europeans. The first whaling vessel, *William and Anne* (Capt. Eber Bunker) called at New Zealand early in 1792, and several British sperm whalers were working each season in New Zealand waters from 1801 onwards. However, it appears that at least one Maori had been taken on board whaling vessels before this date, as the log of the *Mermaid* (London), records that on Feb. 26, 1796, at Rio de Janeiro, the vessel met the Bristol brig *England's Glory* homeward bound full of sperm oil obtained on the New Holland coast, and with it the master of the *Mermaid* "exchanged John Begg, boatsteerer, for an Indian of New Zealand, who has good knowledge of the coast, and signed him on as pilot and boat-steerer on a lay of 68 of one thousand." Unfortunately there is no further information on how this Maori came to be taken on to the *England's Glory;* but it is certain that the later vessels in New Zealand waters began calling at the sheltered Bay of Islands, and encountered Maoris who were growing potatoes and other vegetables from seeds presented by Governor King to two of their race when they were at Norfolk Island a few years before.

The Bay of Islands became a port of call for vessels needing spars and provisions, and by 1805 a number of vessels had taken one or more Maoris on board to assist in the whaling. Enough Maoris left stranded at Sydney were taken on by unscrupulous captains to sealing grounds or other areas to warrant the issue of special orders from Governor King as a protection against this practice. Frequently, especially in the earliest contacts between whalers and Maoris, the relations were very cordial, but a number of unsavory incidents culminating in the killing and eating of 70 persons from the *Boyd* in 1809 led to a period of suspicion and blood-shed between many of the whaling crews and Maori tribes. However, by 1826 Maoris were prominent in whaling crews off New Zealand, and a single vessel is recorded as having no fewer than 12 Maoris in the crew. Their personal courage and contempt for the dangers of the sea made them excellent hands in boat crews, and a number became boatsteerers with such records of success that stories of their skill circulated widely in the South Pacific.

One of the best known came from the pen of Herman Melville, America's greatest writer on whaling, and is recorded by him in *Omoo.* A Maori harpooner missed his first darting at a whale, and after a long pull by the boat's crew under a tropical sun to come alongside it once more, he threw both harpoons, but in his over-anxiety again missed. The taunts and curses of the boat's crew were long and loud; the next time the boat neared a whale the Maori leapt with his harpoon onto the back of the whale and was seen there for a dizzy second before both disappeared in foam.

Much of the material for this paper was obtained during traveling for whale investigations made possible by a grant-in-aid of Research from the Research Grants Committee of the University of New Zealand.

Maori boatsteerer about to hurl the harpoon. (Old photograph, courtesy the *Weekly News,* Auckland)

The crew, with extra help, hauling a whaleboat to the surf at Te Kaha. The stout boatsteerer is at the extreme left. (Old photograph, courtesy the *Weekly News*, Auckland)

The sudden running out of smoking rope showed that the whale was fast, and a few moments later the Maori appeared again at the side of the boat and clambered back in with honor restored.

Maoris were engaged in the crews until the last of the American whaleships ended their work in New Zealand in the 1880's, but it was not so much from the visiting whaleships as from the shore stations that Maoris learned to establish their own whaling ventures.

The earliest shore stations were established in the South Island of New Zealand, and the first began operations near Cook Strait in 1827 and was followed by the establishment of many others on both islands before British sovereignty entered with the Treaty of Waitangi in 1840. In each case some negotiations with and assistance from the Maoris were necessary for the running of the station. It was essential to come to an understanding with local chiefs by barter for permission to use the site, and often as protection against attack or irritations from the natives. Once good relations were established the tribe assisted the shore whalers by growing vegetables and supplying pork and fish or in hut building.

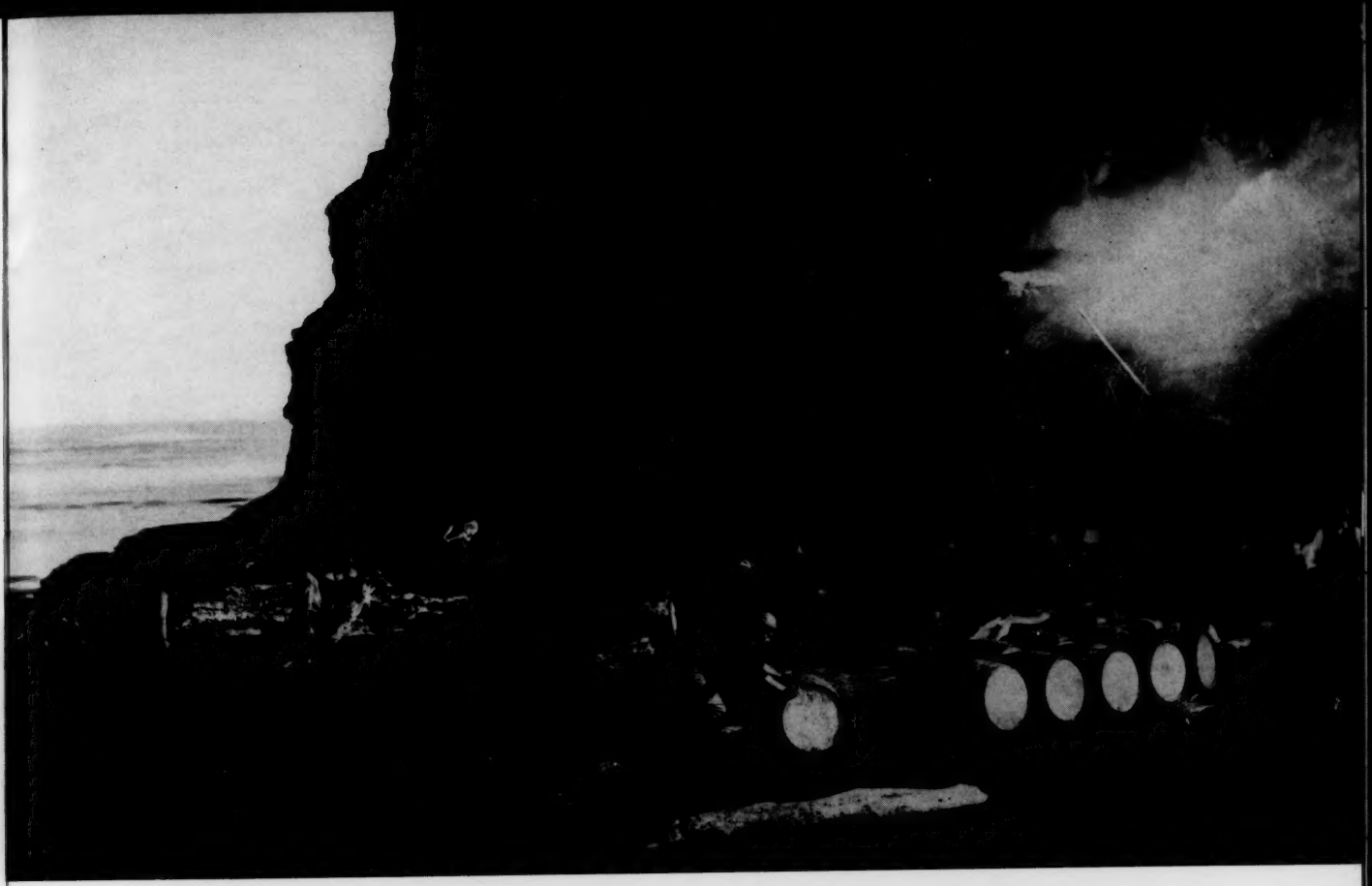
As the Maoris in general had a considerable admiration for the courage of whalers, it was usual for the daughters of chiefs or other women of rank to intermarry with the whalers, and according to Maori custom the rank of the mother is passed on to the children.

Many of these half-castes later married Europeans

Out on the chase, the chief as headsman of the seven-man crew guides the huge steering oar. The boatsteerer in the bow has his harpoon ready to hurl. When fast to a whale he will change places with the headsman who comes forward to make the kill with lance thrusts.

The old Maori chief, as headsman, explains the fine points of the game to the younger generation. The boatsteerer can be recognized, seated third from left. (Credits same as above)

***(Facing page):* No photos of Maori "trying out works" have been located, but these two show European whalemen in northern New Zealand carrying out the same procedure. A flenser cuts the blubber off the whale with his sharp spade while another pulls it away with a hook. Two men carry a piece on a tray to the trypots. The pieces are sliced nearly through like pages of a book, become brittle and dry as the oil separates out in cooking, and are pulled out to use as fuel for the cooking fire. Note the scoop, ladle, barrels, and various other gear.**



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at each generation, and have almost lost all history of the Maori side of their origin, but others again married back to Maoris and had rank plus the advantages of European tradition and customs passed on as an integral part of their family upbringing. The writer has been surprised at the number of prominent Maori families and tribal elders whose European outlook can be traced to such a beginning. The one Maori cabinet minister who has acted for a time as Prime Minister of New Zealand (Sir James Carroll) was the son of a whaler and a prominent Maori chieftainess.

At shore stations as on the whaleships Maoris were soon included in boat crews and proved adept boatmen and harpooners. Right whales were the quarry of the shore based whalers, and they quickly had rivals from overseas vessels which often anchored in the same bays to work during the right whale season. Sperm whaling continued, but as the demand for whalebone rose, more and more British, Sydney, and French vessels turned to right whaling, and were joined in 1834 by the first American right whalers in New Zealand waters.

Despite the ever-increasing competition, shore stations increased during the decade, and the proportion of Maoris taking part increased. At the same time the overseas whaling vessels also increased their use of Maoris, especially the American vessels which could not return to base between seasons like the Sydney and Hobart vessels, but had to stay and depend more on local supplies for food and provisions.

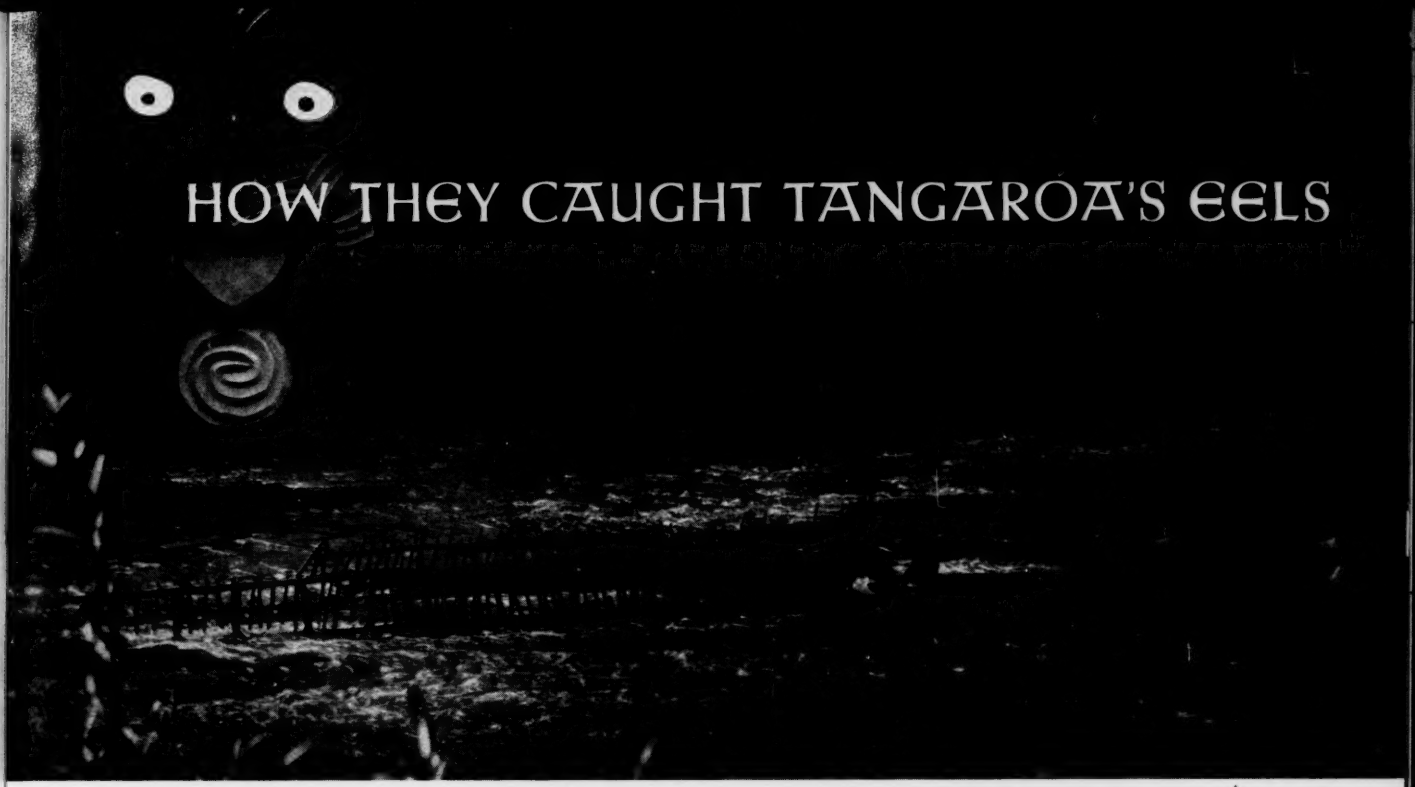
Over-killing of the highly valued right whales in New Zealand bays led to a marked decline in catches during the 1840's, and many shore stations ceased operations, while in others Europeans left to go farming as the land was opened up following the arrival of permanent settlers in the country. Maoris continued whaling alone from some of the sites, and in the Bay of Plenty and parts of the North Auckland coast they later began catching from new sites.

Very little has been published on any of these stations, and I have gathered my information from conversations with Maori elders in numerous places along these coasts. From them it seems clear that Bay of Plenty whaling was in part a continuation by Maoris of stations once used by Europeans over a century ago.

The right whale was still the main objective of shore parties on the rare occasions it was now seen, but the humpback whale, which also passes these coasts, produced about 5 tons of oil each, and although it has no valuable baleen the revenue from oil was enough to finance communal ventures. In this method of use of the revenue the Maoris differed greatly from that of their tutors whose lay system allocated the largest proportion to the station owner and then decreasing proportions to headsmen, boat-steerers and men, while the purely Maori concerns reverted to their usual communal ownership of material for the tribe as a whole. Even the excitement of the chase was treated more as a sport and a source of prestige rather than rivalry for ownership, and whales in the Bay of Plenty were often towed to trypots in some neighboring bay if weather made towing too difficult with open boats. The theater and some other community buildings at the native settlement of Te Kaha in the Bay of Plenty are among the products from this arrangement. The Maoris did not regard whaling so much a livelihood as a rewarding seasonal pastime which did not interfere with their maize and crop growing. In this form it persisted until about 1900 from at least six sites north of Bay of Islands, and ended there with the introduction of dairy farming. Along the east coast at Mahia Peninsula it persisted for a few years longer, and in the Bay of Plenty it continued until about 20 years ago. Early in the present century almost all suitable coves in the eastern half of the bay were used as whaling sites, including at least 12 small concerns; but all were still using open whaleboats, hand harpoons, and lances in the style of the mid-nineteenth century.

At tribal gatherings around 1930 the elders decided that the communities would be better to change from maize and crop farming to dairy farming, so cream factories were built and former whalers were milking cows and feeding calves at the time of day they had formerly found best for sighting whale spouts. Although the whale catches had been very small by modern standards, ranging from only two to six or seven whales per season for any one group, it did provide a tangible link with many of the whaling practices immortalized by Melville in *Moby Dick*. Its special interest to New Zealand was the spectacle of purely Maori concerns that provided living evidence of the techniques and excitement in which our first European residents had so intimately participated as they unconsciously prepared the way for later settlement of the country.

The closing of this romantic era of whaling has not ended Maori connections with the industry in New Zealand, as a number have taken part in the two stations which had power-driven chasers and explosive harpoons of modified Norwegian type. The first of these began using this equipment at a site near the Bay of Islands in 1910, and had a staff who were mainly of Maori or part Maori descent. The only station remaining in operation is in Tory Channel close to the site of the first New Zealand shore station. From it one hundred or more humpbacks are caught and processed per season. At the factory about half the workers are part Maori, and the chief engineer who is also foreman of the works is a Maori. A number of past gunners have been Maoris, and a driver of one of the high-powered launches used as chasers is part Maori, and like many of the others in the station he is a direct descendant of one of the whalers and his Maori wife at the earliest New Zealand shore station.



HOW THEY CAUGHT TANGAROA'S EELS

DERISELY F. HOBBS

THE MAORI WAS A SKILLED FISHERMAN/ A WISE CONSERVATIONIST

BROWN and rainbow trout, spring salmon – interest in freshwater fisheries in New Zealand today is focused sharply on the introduced species. An exceptionally high proportion of waters meet the environmental needs of these fishes; temperate conditions make for a long growing season, rapid growth, and, in the case of the trouts, the attainment of higher average sizes than is usual in their countries of origin. New Zealand has an abundance of rivers and lakes well distributed with respect to the human population. But valuable as these new fisheries are for recreational angling, neither the national economy nor the social organization of the people would be seriously affected if the introduced species disappeared and New Zealanders were once again dependent on indigenous species.

Except for eels, which are abundant and large (females of the long-finned species sometimes exceed 40 pounds in weight), and for the larvae of *Galaxias attenuatus*, which support a commercial whitebait fishery, the native fishes are mostly so small or rare that people know little of them.

Failure of eel and other inland fisheries 150 years ago would have been calamitous to the Maori people. It could well have caused a major upset leading to the abandonment of important settlements and to tribal wars. People from the interior of the Islands might have been forced to invade coastal areas for food. Inland the choice of foods was much restricted – fern roots, sweet potatoes, birds and fish. Birds of the forests, which were only seasonally abundant, would have provided an inadequate meat supply for a robust and warlike race. Thus because his well-being was intimately dependent on them, the Maori knew his fishes well – the various kinds, their favorite habitats, and their seasonal migrations. Necessity had taught him how, when, and where each kind could be most easily captured and preserved. And of all the fish, the rich, oily eel was most abundant. It is said that in the South Island, in the lower Wairau Valley, where there was never a large Maori community, there were somewhere about 30 miles of channels and canals made purposely to facilitate the capture of eels and water-fowl. In the North Island rivers there were great palisade-like structures – the *pa tuna* or eel weirs.

▲ Servicing a small *pa auroa* or eel weir on the Wanganui River, North Island. The fine dugout canoe was fashioned with stone adzes from the trunk of a single large totara tree. Even after European settlement, rivers were New Zealand's main roads.

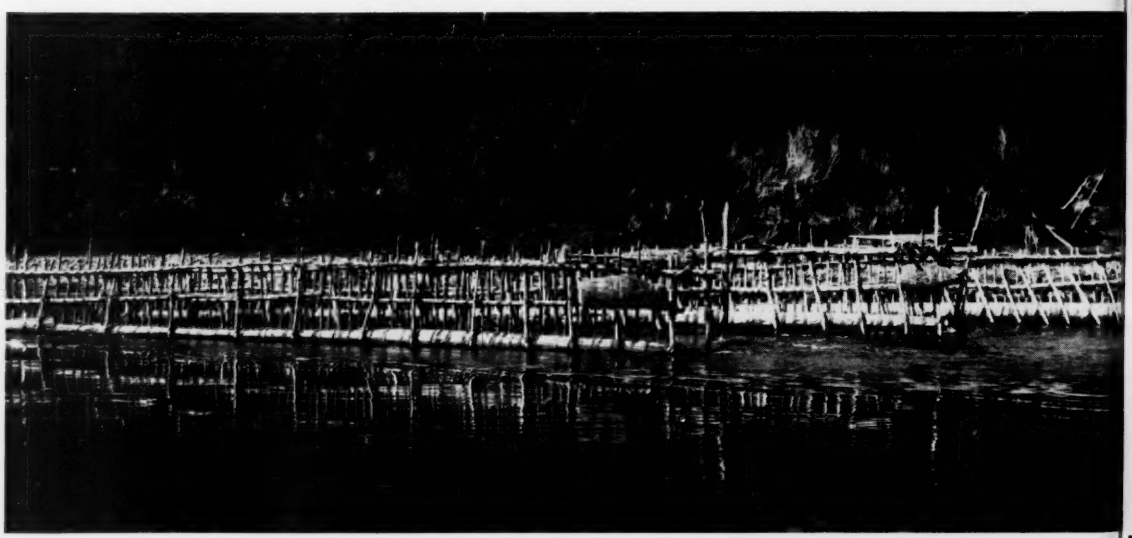
One of the last of the great eel weirs, about 30 years ago, on the Wanganui River. Its three fences are each 60 feet long and are set 15 feet apart, slightly across the line of current.

Now a primitive people does not play the fool with its food supplies. The Maoris were sound conservationists generations before we ever awoke to the need for such a word. The Maori used his natural resources wisely. He fished to satisfy his more substantial needs, not for sport. He took what he and his family required and – except to feast a guest – no more. The taking of fish was hedged in with various saving taboos. There were no photographers to record his captures, no newspapers or angling journals to encourage bragging about his prowess. While feats of arms were proper things for tribal bards to chronicle, wasteful and excessive killing of fish would have been too shameful for decent men to speak of. Only if the legendary monster, the *Taniwha*, had been enmeshed could the tale have been told and indeed the wonder of it would have persisted for generations.

Tradition dies hard. Even now, the Maori, if he fishes at all, is usually averse to killing for commercial purposes. One can admire this attitude and yet regret to see a race once so skilled in fishing, becoming dependent on others for supplies. I once thought to remedy this and, in my ignorance, planned the rehabilitation of some of the former Maori eel fisheries – to be run by Maoris alone for the sale of eels to other Maoris. A Maori leader was embarrassed by the need for dampening my well-intentioned enthusiasm. He questioned a number of his kinsmen before me and all said it would not work. Finally, he put it to me this way:

"A Maori comes down to the water and finds a Pakeha – that is a European – fishing. The Pakeha may have 10 or 20 fish but still he goes on. The Maori, he fishes and takes three fish and stops. That's enough – one for himself, one for the neighbor on his right, and one for the neighbor on his left. The rest? Why catch and sell them? Better that they should be there when wanted on another day."

Here's another slant on the same thing. It means little to you or me if we waste some part of what we catch. But with the Maori it was different. If he wasted the gifts of the gods – the eels of Tangaroa of the Many Ways – there would have been dire consequences – and apparently there still can be. Not so long back, I went one night in March to watch the Maoris taking migrating eels at Lake Forsyth in Canterbury. Forsyth is one of the very few places where the ancient methods are still followed. A narrow shingle bank separates lake from sea. Against this on dark nights eels congregate and seek a passage seaward. The Maoris cut narrow channels across the bank part way toward the ocean. These open out into small pounds in which baskets of netting (formerly flax) are placed. When all goes well the eels push down in great numbers and the baskets are lifted out as they fill. The night I was there things went wrong.



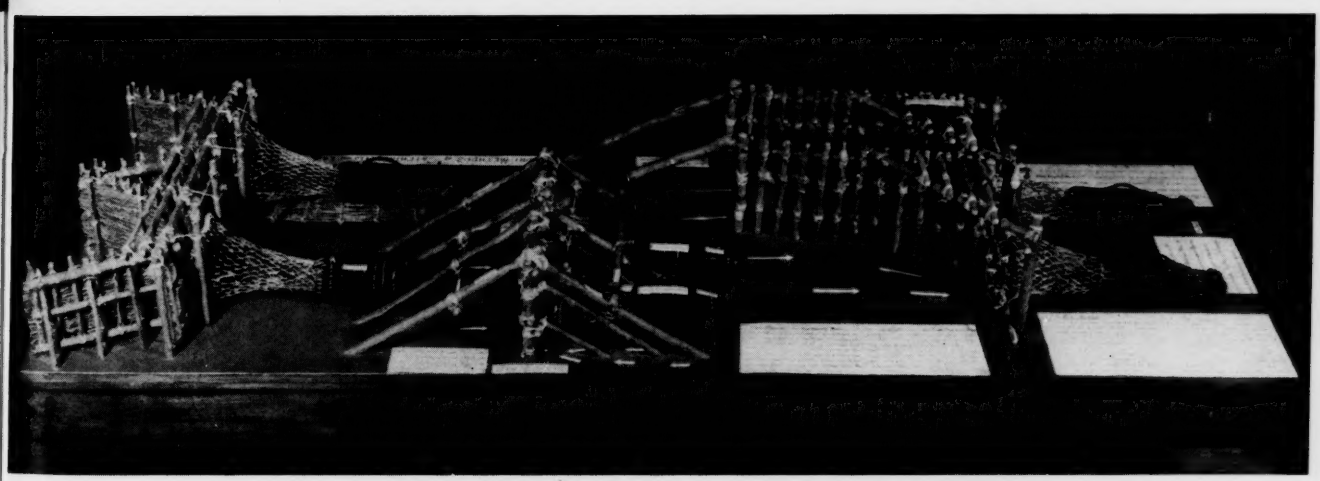
Lower end of a Wanganui River eel weir showing the huge reserve wicker baskets or *hinakis* secured below the servicing platform. In use the baskets are, of course, submerged and are connected by a funnel-shaped leading net fixed to the lower end of the wall of deflecting timbers. (Photo credits are at the end of the article)

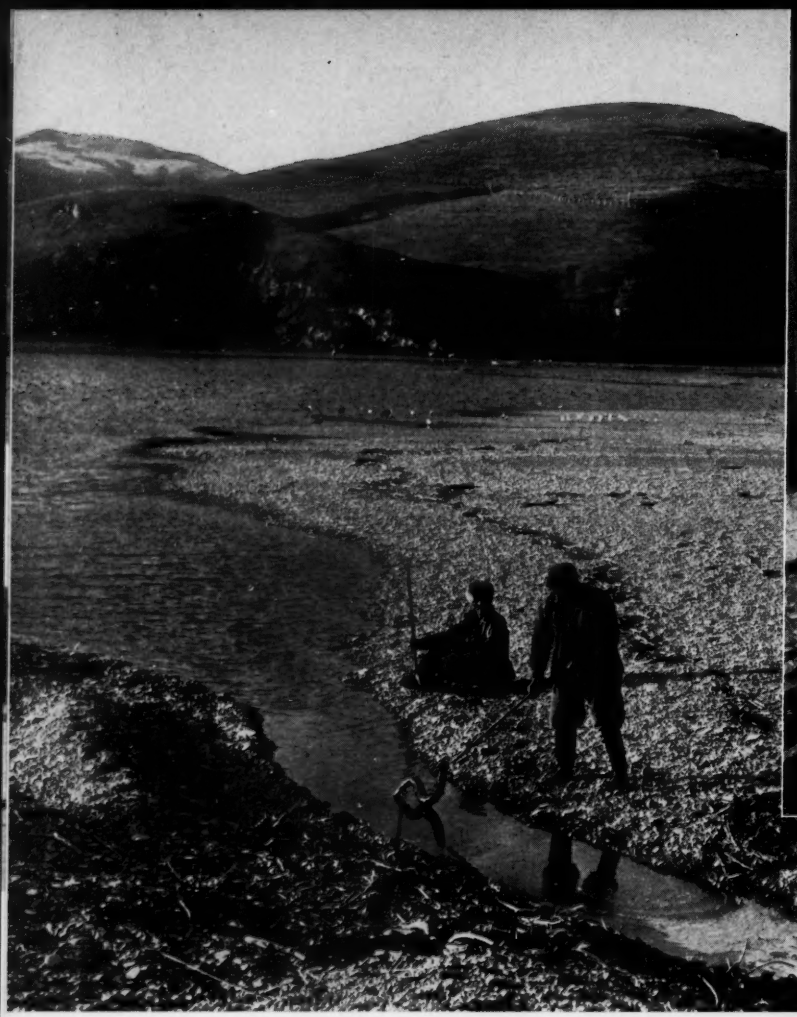
Models of sections of traditional types of Maori fish-weirs or *pas*. To left, a *pa tauremu* for taking eels and other fish migrating down a small stream it could fully span. Center, a *pa piharau* or lamprey weir. Right, a much shortened section of a *pa tuna* or eel weir. All have the *hinakis* and leading nets. The *pa* (or *utu*) *piharau* is designed to catch lampreys migrating *up*stream.

Few eels came when there should have been hundreds – and there was a good reason for this, so an old Maori later told me. An ignorant young Maori, a woman at that, had wastefully thrown away a few smaller eels from the first night's catch – not thrown them back to please the gods, but actually had thrown them out on the stones to die and rot.

For each fish according to location, season and habit there was a well-proven method of capture. The succulent freshwater crayfish or *koura* was especially abundant in the eel-less lakes such as Rotorua and Roto-iti. He was caught thus. Bundles of brushwood were lowered at dusk to the lakebed and buoyed. The koura is nocturnal and roams and forages. As daylight approaches it seeks convenient cover – the brushwood bundle. In the morning gently, oh, ever so gently, the Maori pulled up the bundles and lifted them into the canoe. Then a sharp shake spilt the koura into the craft.

The Maori had no fish-ponds. Yet he often kept eels on hand in huge wicker baskets tethered in a nearby stream. By capturing the baby eels – the elvers – in coastal waters and transporting them to Taupo and other inland lakes he sought to offset the impoverishment caused by the hungry Taniwha – a monster which lived down the outlet river and ate all the young eels which would otherwise have traveled upstream to Taupo. Such attempts failed for the few eels which developed to a decent size would have been inconspicuous in so huge a body of water. Further, they would ultimately





Maoris "jag" or gig eels caught in a blind channel as they head for the open sea from Lake Forsyth. This trap has been handed down for generations for exclusive use of heirs.

Mr. Nutira tests "green fish," eels drying in the early stages before cooking. After wind-drying, sometimes for several weeks, they are boiled for 10 minutes then dried in the wind again for several days.

← Mrs. Nutira bones eels on the lee side of her *whare* or house. Nutira is the Maori for New Zealand.

have migrated to sea in order to spawn. However, this is a small failure to record alongside the Maori's main efforts. Those which persisted, longer probably in the Wanganui River than elsewhere, certainly deserve mention. This river in particular was the home of the great *pa tuna* or eel weir and the *pa piharau* or lamprey weir. The eel weirs—there were dozens of them—were valued tribal property, each dignified with an individual name. They were substantial timber palisades, up to 60 or more feet in length and offset somewhat from the line of the current. Essentially they were deflecting barriers leading, at the downstream end, to a funnel of netting which led through to a huge holding basket. The main timbers in some such weirs were up to 18 inches in diameter. Just imagine the job of driving timbers up to the thickness of telegraph poles into a stony river-bed and doing this with a hand-maul from canoes! These weirs took many tons of eels in prime condition as they migrated down toward their ocean spawning grounds.

Strangely different, but equally efficient, were

→ *(Upper):* Women collect flax on the hillside above Lake Forsyth, and *(lower)* make baskets for carrying the cured eels, while the men attend to skinning them and drying them on racks, *whata*.

← Mr. Nutira fishes the eels up from the boiling pot while his wife has a *smoko* after her hard work. Boiling makes the eels pliable for eating. After the last drying they are packed and forwarded to other Maoris.

Racks of drying eels outside the whare, and more being boned. The gulls are standing by for a handout and the menfolk are just standing by.

the smaller lamprey weirs. They had to take lampreys when migrating upstream. They were always erected on dry river-bed for use in flood time. Under flood conditions they were partly submerged. Then lampreys swarmed upstream, keeping to the sheltered margins and taking advantage of anything which broke the force of the current. This is just what the lamprey weir did. It was a mainly solid fence, standing squarely up from the bank, but broken at regular intervals by small gaps through which flood waters rushed. Shortly below such gaps the Maori affixed funnel-mouthed traps. Lampreys swam up in the shelter of the barrier and, in seeking to pass through the gaps, they were washed back into the traps.

The efficiency of Maori methods can well be demonstrated by a comment on recent attempts to control lampreys in the Great Lakes of North America. The threat to valuable commercial fisheries which arose from the extension of range of this lamprey necessitated exhaustive enquiries by fishery scientists and practical fishermen as to suitable control measures. Finally a trapping technique long used in the Baltic States was adopted as a highly efficient method. It is not, however, generally known that this approved technique is identical in principle with that developed independently generations ago by the Maoris in the South Pacific.

A few years back I was required to prepare evidence for a Royal Commission which was investigating Maori claims for compensation for alleged loss or interference with traditional fisheries on the Wanganui River. An exhaustive review of facts led to only one conclusion: that there had been no deprivation but simply a voluntary abandonment of exercise of rights as, with the settlement of the country by Europeans, flour, vegetables, pork, and mutton became readily available.

This substantial emancipation from earlier dependence on indigenous foods was rapid and very general. The few survivals of traditional methods as at Lake Forsyth occur erratically. Fortunately, while there was still time, the Maori techniques and fishery lore, including the interesting lunar fishing calendar, were very adequately recorded by Elsdon Best, Downs, and others, while the Dominion Museum in the case of the Wanganui River fisheries and the National Publicity Studios, in the case of the Lake Forsyth eel fisheries built up valuable photographic records which I have been permitted to draw on to illustrate this article.

CAPE KIDNAPPERS'

THOUSANDS OF BIRDS, leaving the nest clumsily but returning to it with the beautiful precision of homing planes – such a sight may be seen by visitors to the extraordinary gannet colony at Cape Kidnappers, the sharp-toothed southern outcrop of Hawke Bay in the North Island of New Zealand.

The famous gannetry of Cape Kidnappers whose lofty nursery overlooks Hawke Bay is a place of pilgrimage for hundreds of visitors yearly. The Cape is believed to be the sole place in the world where the gannets nest on the mainland. On an almost level plateau the myriad birds nest so closely ranked one is amazed that, once they have left it, they can ever find their way back to the right nest.

These nests are nothing much – just a scratching of dried seaweed, and a handful of fishbones. They take little enough building, so as soon as the birds arrive, in about September, they have nothing to do but lay and start incubating. Pa and Ma gannet take turns keeping the egg warm until it hatches, and then they both set to work fishing to feed the great ungainly, downy nestling that pops out. (Only one egg is laid at each sitting.)

Like a heavily weighted airplane, they cannot rise without a long take-off on the water, or without launching themselves off the edge of a cliff when on land. As they waddle from nest to cliff-cornice, they run the gauntlet of a fusillade of malicious pecks from their neighbors along the route. But coming back they simply plump straight down beside the nest. Hardly giving the old birds time to pick themselves up, the greedy youngsters thrust their bald heads down their parents' throats and snatch the fish they have swallowed for safe keeping.

Both young and old birds appear almost unafraid of visitors although they puff and blow peevishly when a visitor strays too close, taking any opportunity to stab bare ankles with dagger-like beaks.

When six weeks old, the youngster is bullied into toddling to the edge of the cliff. By then he has shed his down and donned a natty garment of speckled feathers, which, when full grown, he will change for the fine black and white attire of the adult gannet. (Beautiful bird!) But that stage is far away, and meanwhile, at the edge of the cliff, he is cruelly shoved off into space, and to save his neck must spread his wings in flight. He is content to plane down to the sea; but until he learns to take off, and circle and glide, and dive for fish, he has a hard time of it, and has to go hungry – a powerful incentive for learning.

...S' COLONY

THE UNIQUE GANNET NURSERY OF HAWKE BAY

R. T. WEARNE

Gannets are long-lived birds and have few natural enemies. This fledgling period is the only one when mortality is likely to be heavy. That is no doubt nature's reason for the small brood; it keeps the gannet population within bounds and the fishing grounds from being overtaxed. A hungry gannet eats its own weight of fish daily. No wonder a faint aroma of herring hangs about the nursery.

Gannets are worth watching, as they are superlative divers. They just shut their wings and plop into the water, living projectiles. They seldom miss their fish. Although they live almost entirely on fish of the herring type, they have a practical value to fishermen. The birds have a knack of finding large shoals of fish, and in this way indicate to fishermen areas where they might make a good haul.

A most interesting phase of gannet life is their courtship period. This goes through three stages. It all begins when the female sits forlornly on her nest and a male flies along. After she catches his eye he cooperates by bringing some seaweed to help line the nest.

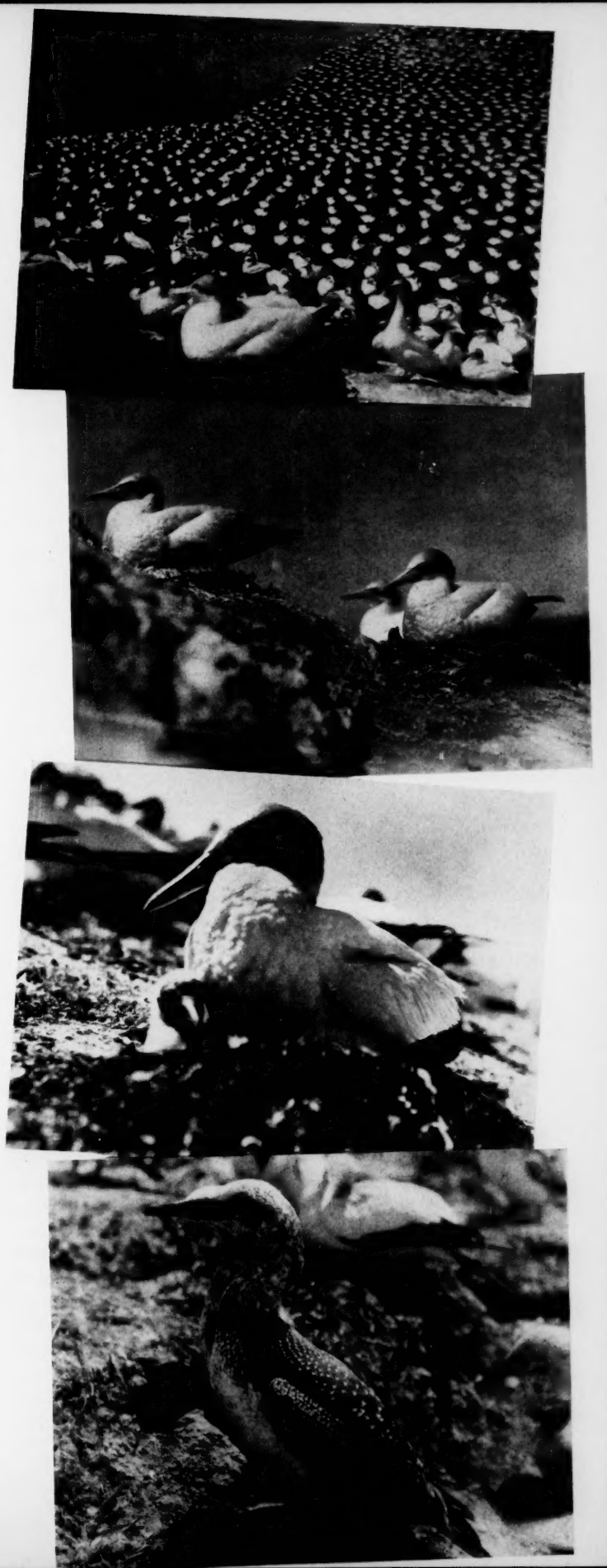
After this, as a show of appreciation and goodwill, the hen stands in the nest and does a solo dance. During this dance she utters sharp calls and bows to the left and then to the right. As well as being contagious, all this seems to fascinate the male.

The next step in the procedure is the greeting ceremony; with their beaks touching and facing each other, they begin calling. Then follows the waving and dipping of heads and the stroking of necks. When this is going on they seem oblivious to any human beings or other birds near them.

Nesting goes on all summer long. The egg is held in the webbed feet of either male or female for equal periods. The parents also share the feeding duties.

Gannets have to keep to themselves in their colonies. The average area for mating, sitting on the nest and taking the infant for a walk has a radius of about 20 inches. If they misjudge their landings when returning home, there is trouble with the family next door, and they are greeted with pecks, shrill cries, and unneighborly hisses.

The birds have helped to make Hawke Bay an attraction for tourists, for it is there sightseers have their opportunity of watching the birds at close range. Nesting places on the New Zealand coast are at Three Kings, White Island, and Gannet Island. Related species of tropical birds are the shags, boobies and pelicans.



The gannetry at Cape Kidnappers — close-up of the crude nest; a chick has his first look at the gannet world from under mama's breast feathers; a youngster breaks out in adolescent spots. (Author's photos)

GIANTS IN THE NORTHLAND

V. J. CHAPMAN

ONCE upon a time much of the North Island of New Zealand was covered by extensive forests. Man, to gain a living from the soil, cut them down until only fragments remain. In the ancient days much of the forests that clothed the northern part of the North Island contained grand trees that towered above their neighbors. These giants of the forest are known as kauri, their botanical name being *Agathis australis*. The genus *Agathis* has only a few species, the kauri being confined to New Zealand. Thus, like the giant redwoods of California, the kauri is now a museum relic because it occupies only a fraction of its former area, and but for the fact that certain areas have been reserved it might have disappeared by now.

According to one eminent authority the kauri is the greatest timber producing tree in the world, not excepting even the giant redwoods. Hence one can perhaps understand how it is that it was so eagerly sought after and why such wholesale destruction took place. Kauri timber is especially valuable because it is highly resistant to borer beetles.

Although great forests which must have contained kauri existed at one time, only one such forest of any magnitude now remains. This is Waipoua Forest which lies athwart the Dargaville - Opononi road not far south of Opononi. This area, which was bought by the Crown from the Maoris with later additions, is now vested in the State Forest Service.

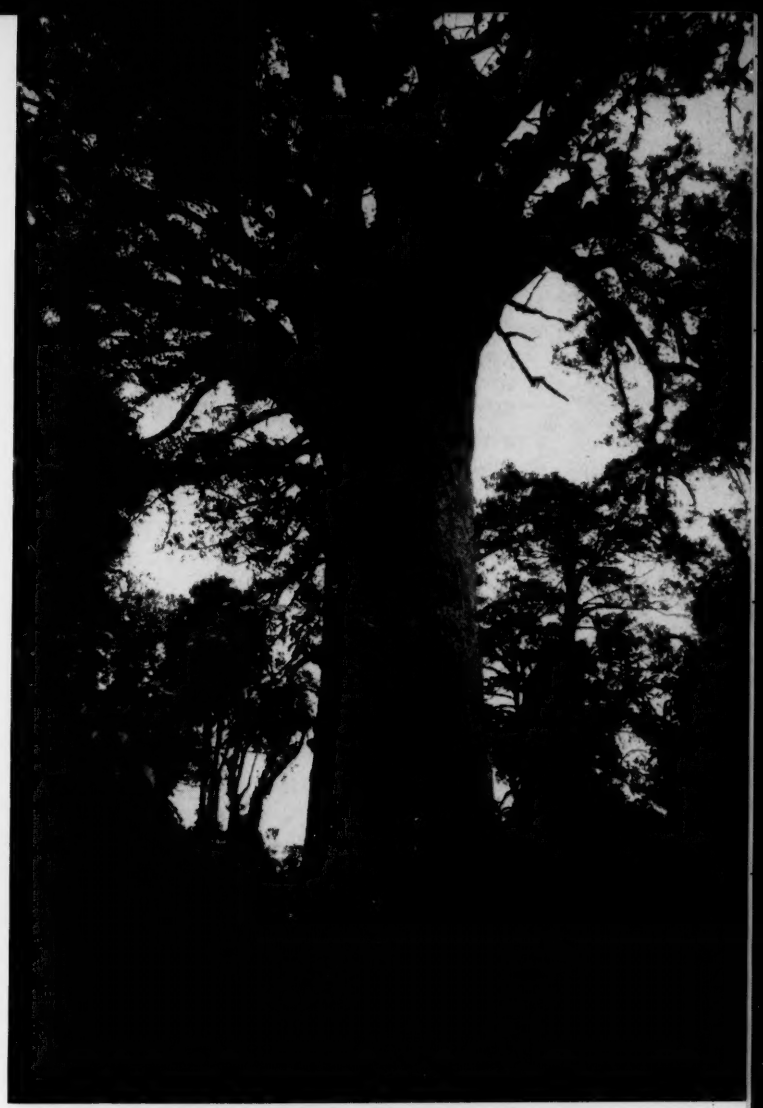
At one time or another people have realized that some areas of kauri should be preserved so that these giants would not disappear for all time, Trounson Park, not far from Waipoua, contains what is probably the best and finest stand of these trees but it is not very extensive. Furthermore it is surrounded on nearly all sides by open grassland; it is therefore exposed to the strong gales that sweep in from the Tasman Sea, and these may bring about the ultimate downfall of each of the giant trees. There is also the possibility of fire damage, as we shall see.

The forests are vital to our water supply. Near Auckland, the Dominion's largest city, there is a range of low hills, the Waitakere Ranges, much of which was formerly clothed with kauri forest. A large portion of these ranges is now reserved by the city waterworks department as a catchment area and by the Centennial Park Board, and it is their aim to encourage the rebirth of kauri forest on these hills. In one place, known as the Cascades, which is a favorite haunt for trampers, there is still a block of kauri left, although the trees are not so large as those of Trounson and Waipoua. Apart from these major reserves there are some smaller areas scattered over the North Auckland Province. Waipoua State Forest preserves and manages a portion of Waipoua, mainly areas adjacent to the State highway.

The kauri is a very long-lived tree, most of the giants of the forest being well over 600 or even a thousand years old. Such a cycle is too long for normal forestry practice and in the managed area the trees will be allowed to grow for only about 200 years.

The peoples of New Zealand have in recent years come to appreciate not only the scenic beauty of these trees but also their museum worth. Thus in 1928 when the State highway was constructed through the very heart of the forest considerable concern was expressed because it was feared that the highway would open up a wind channel and expose the trees to felling by wind. Fortunately these fears do not appear to have materialized, and the road is in fact a great asset since it enables the tourist to see these marvels of nature to the best advantage – some of the finest trees line the roadside.

Although Waipoua is located in a part of New Zealand where there is very heavy rainfall (kauri forest is in fact subtropical evergreen rain forest), there is a period in summer every year, varying in length according to the dryness of the season, where there may be danger from fire. A similar threat also exists at Trounson and in the Waitakeres and in both of the last two it is perhaps more serious because of the nature and control of the adjacent scrub and grassland. The State Forest Service maintains fire equipment at Waipoura but it does not operate an air patrol as it does over the great areas around Rotorua. Apart from the



Tane Mahuta. (Courtesy New Zealand State Forest Service)

main highway, tracks into the forest for fire fighting machines are poor and access roads need to be constructed at strategic places. These access roads will also open up the forest area even more to tourists.

Waipoua forest is not by any means entirely covered with trees. The total area of the so-called forest is 39,000 acres but only 27,000 acres bear indigenous forest. The rest is scrubland, which the Forest Service is slowly but steadily planting with exotic conifers of various species. This planting is on very poor soil, largely a consolidated blown sand with a low cover of shrubby tea tree *(Leptospermum)*. The well-laid-out pine blocks with their fire breaks propably represent better insurance against fire than the highly inflammable tea tree.

The State Forest Service has also begun to lay out an arboretum at the southern entrance to the area and this should prove an additional attraction.

One or two of the kauri trees in the forest are so huge that they have been given special names, and whatever the Forest Service may do these trees will surely never be felled. The one most readily accessible from the State highway is called Tane Mahuta, a Maori name, which means "the first born of Tane" (the forest god). This tree is 43 feet in girth and 42 feet up to the first limb. Its age is estimated at 1,200 years and it has been calculated to contain 72,000 superficial feet* of timber. Tane Mahuta, however, is not the largest tree in the forest. Pride of place goes to another rather less accessible. This grows near a swamp area in which all the kauri trees have died, probably because of the water conditions, but their remains have been removed during the last few years. The giant of giants is known as Te Matua Ngahere (the Father of the Forest). Its girth at breast height is 53 feet.

*Approximately equivalent to board feet in the U. S.

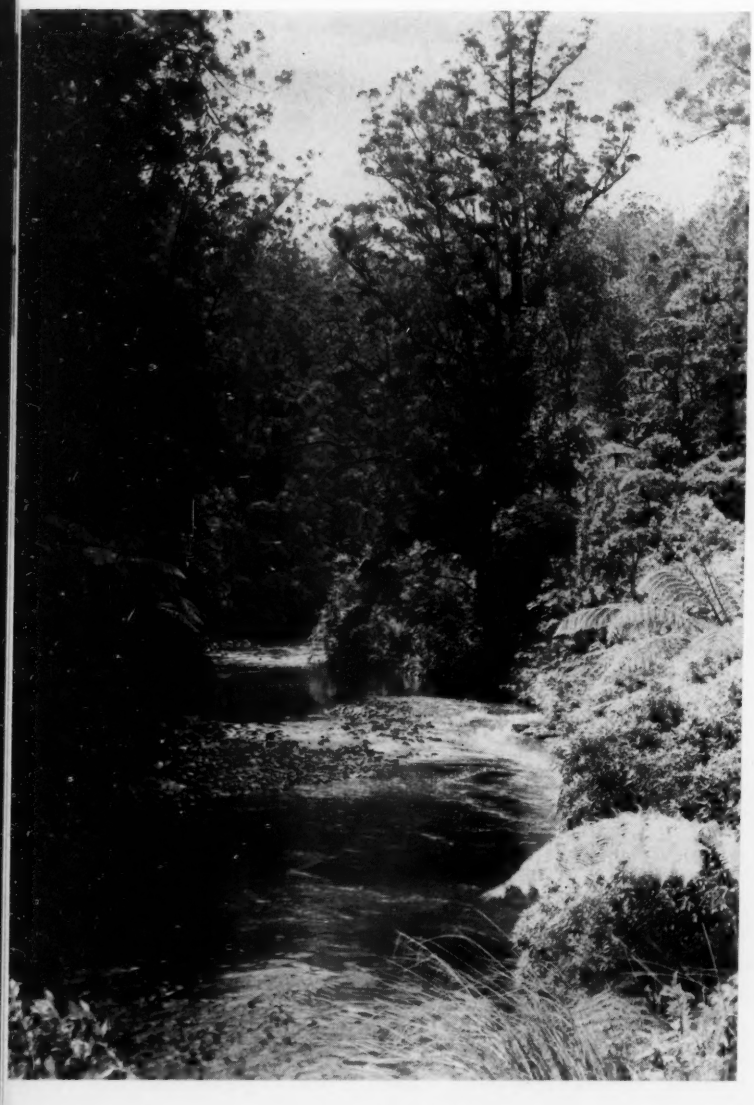
There is a great mound around the base of every large kauri. These mounds, which may be several feet high, are the result of many years' accumulation of humus from the decaying bark which perpetually scales off in large flakes. The mounds, which are called *pukahu* by the Maoris, are frequently occupied by various plants, such as tree groundsel.

One of the principal problems facing the State Forest Service at the moment is the regeneration

Snags are considered unsightly and are removed, but they reveal the branching structure of the kauri. (Courtesy New Zealand State Forest Service)

A gum-climber ascends a kauri with hand spikes and spiked boots. The bag is to carry the gum he chips off. (N. Z. State For. Serv.)

of kauri, because the perpetuation of the area as kauri forest depends on successful natural or artificial regeneration. As the visitor wanders through Waipoua he will come across groups of young trees or groups of seedlings. It is thought by some people that when one of the old trees falls young saplings would arise in its place, because of the increased light available, but this sequence is by no means always true. It has also been said that too much light is inimical to the growth of young trees, and yet one can find specimens growing happily along the edge of the State highway.



A stream in the heart of Waipoua, flanked on either side by stately kauri trees. (New Zealand State Forest Service)

There have been recent experiments to find out whether natural regeneration can be aided. In one place all the undergrowth was cleared and has since been cut down regularly. The result has been a veritable carpet of seedlings, the growth of which is much improved if competition with the roots of other plants is eliminated by digging a trench around them. Another area from which shrubs were removed also contains numerous saplings, but in this case it is evident from their age that the plants were there before the removal of the shrubs, and the disappearance of the shrubs only resulted in a greatly increased growth of the saplings. In other places, however, clearing does not always result in the appearance of seedlings and saplings; nor does one always find kauri growing up under the scrub vegetation of tea tree which is reputed to be an ideal nursery tree for the purpose. One must suppose, therefore, that although light conditions may be favorable, nevertheless this is no good unless soil or other conditions are also suitable.

Kauri is one of those trees in which the roots are always associated with the threads of a fungus: such fungal associates are known as mycorrhiza. It is not impossible that in areas where apparently kauri will not regenerate the special mycorrhiza are absent, and the soil may even be toxic for their development.

In this matter of regeneration, which is so important for the survival of kauri, it is possible that drainage may also be one of the soil factors. Kauri trees die in areas that have degenerated into swamps, and the trees are commonly found on the upper parts of slopes and on spurs and not so frequently in the valleys. There is also some reason

A huge afforestation scheme on the Volcanic Plateau aims at providing a sustained-yield forest of exotic softwoods for timber and pulp products. California's Monterey pine is one of the trees most widely planted. Government holdings alone total over 250,000 acres. (RNZAF)

to suspect that the seedlings die unless the drainage is moderately satisfactory – but this problem is still subject to experiment.

The adult kauri has a characteristic habit which is readily recognizable. This habit, however, is only developed relatively late in life, probably when the trees are between 150-200 years of age. The young saplings are spindly but as they grow they soon develop into robust trees with a markedly pyramidal habit. In this state they are known as "rickers." New Zealand is particularly rich in tree species that have a juvenile as well as an adult form, and the kauri is not by any means the least spectacular.

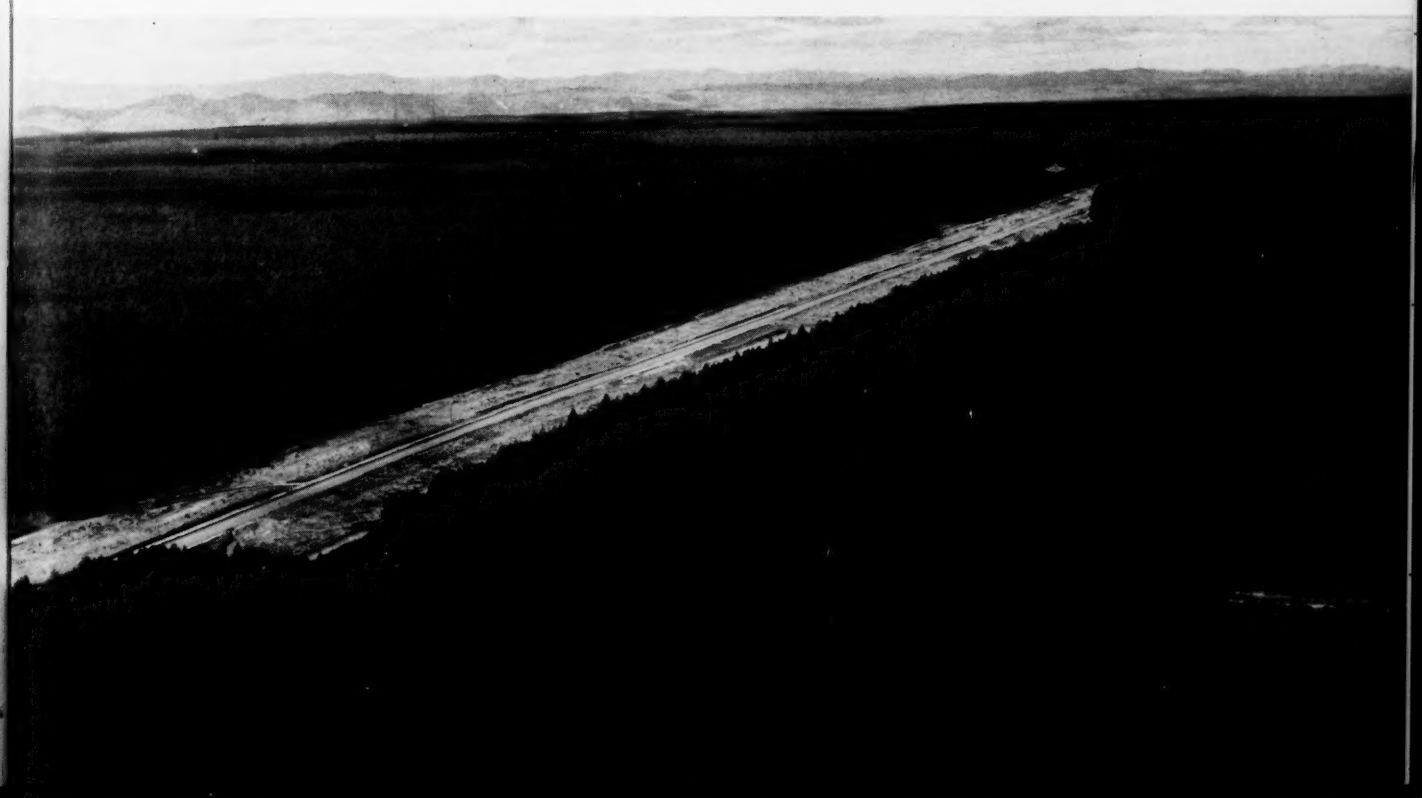
In the past the kauri tree has been important not only because of its valuable timber but also on account of the kauri gum, which is important in the making of varnishes. This gum normally tends to collect in the crooks of branches, but it can also be induced to flow at any point by wounding the tree. In the old days, because the gum was so valuable men used to climb the trees and collect it, and then later the trees were deliberately damaged by cuts in order to make the gum flow more freely.

Kaui trees are not easy to climb and two methods were used by the gum collectors. In the one the climber has spikes attached to his boots and holds similar sharp spikes in his hands. By sticking these firmly into the tree one after the other he can climb up until he has reached the first branch. The other and older technique was to throw a light cord with a weight attached over the first branch. Then a thicker rope was hauled over and brought down. The climber used this double rope to ascend, and finally he could fix a board to one rope and sit upon it, raising and lowering himself by the other rope end. When he came opposite some gum he wrapped the free end of the rope around his leg and anchored himself to the tree by means of a hook fastened to a cord at his waist. He was then free to chop off the gum.

It is believed that bleeding for gum injures the trees, so gum bleeding has been forbidden in Waipoua. Only one man has a permit to collect gum in the forest but he may not bleed and can only chip off pieces of gum that have exuded naturally.

In the past the gum fell to the ground and sooner or later became buried in the soil. Much of the land in the northern part of New Zealand has been dug over by gum diggers in order to secure this buried gum. Formerly gum digging was practiced in Waipoua, but again this has been stopped for many years. Not only did the gum diggers damage the ground vegetation and perhaps dig up young kauris, but it is evident that they also lit fires at the bases of the trees, because some of the old dead trees that the Forest Service have recently been removing bear fire scars at the base.

In Waipoua, the last great forest with much kauri, New Zealand possesses a great treasure. The kauri forest, the arboretum, and the exotic plantations make Waipoua a place for both the tourist and the professional scientist to visit.



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The nature and men of New Zealand

The purpose of this special issue has been not so much to satisfy as to arouse curiosity about New Zealand. Her eventful history, for instance, has been entirely omitted, although pertinent to this journal of nature and man in the Pacific world. Here, of course, is where books come in — to fill this and many other gaps, as many as there are individual interests. Thanks are due the several New Zealand publishers who sent us selections from their lists on request when this issue was just an active idea, and who have patiently waited many months to see these brief notices in print. Most booksellers will gladly handle orders.

Land Uplifted High. By John Pascoe. Whitcombe and Tombs Limited, Christchurch. 1952. 235 pp., 22 photographs, 4 maps. 18s. 6d.

Any reader happily introduced to the New Zealand high country through part of Scott Russell's *Mountain Prospect* (1946), reviewed in *PD*, may find this intimate and informal log of tramping equally yielding of the feel of the bush and the tang of the air of these untamed heights, if somewhat less inspired. Something added here, over Russell, is the North Island, where the Tararuas make up what they lack in altitude by sheer cussedness of climate, of which, says Pascoe, "the least written the better." He takes us on north to the volcanoes, too — Ruapehu and Egmont. This is a mountaineer's book; Sierra Club members should feel quite at home in it.

The New Zealand Guide: incorporating *Wise's N. Z. Index to Every Place in New Zealand; a Comprehensive Gazetteer, Geographical Reference and Travel Guide.* Compiled by Edward Stewart Dollimore, F.R.G.S. H. Wise & Co. (N.Z.) Ltd., Dunedin. 1952. 926 pp., 33 photographs. 35s. U. S. and Canada, $5.00.

A veritable encyclopedia, *The New Zealand Guide* has been a very present help to the editor in preparing this special issue. It would be hard to imagine a more useful item on a New Zealand reference shelf, or a more complete and helpful vade mecum for the traveler. The bulk of the book comprises the "Abbess Peak"-to-"Zora Glacier" location and description of "all cities, towns and localities; all features — mountains, glaciers, plains, rivers, streams, lakes, fiords, bays, harbours, capes, headlands, islands, and other physical features of New Zealand and its territories." The full-page halftones are exceptionally well printed. The 30-odd pages of General Information contain "details about discovery, history, development, progress, trade, government, people, etc. — about natural history — flora, fauna, avifauna, climate, staple products." And the 10-page Travel Guide gives "practical information and counsel for all who contemplate travel within this pre-eminent tourist country." Surely, if you are planning a trip to New Zealand, you would do well to start by getting a copy of this book.

Reed's Atlas of New Zealand. Compiled by A. W. Reed. A. H. & A. W. Reed, Wellington. 1952. viii + 64 pp. 12s. 6d.

Since Mr. Dollimore's *Guide* contains no map section, you should also provide yourself with this small but comprehensive *Atlas* with its 18 pages of large-scale sectional maps (North I., 13 miles to the inch; South I., 16 miles to the inch). There is an 8-page section of line drawings of prominent features and activities; a 1-page map of political divisions; a 1-page physical map; 2-page maps of North and South islands about 40 miles to the inch; 18 pages of temperature, rainfall, products, farming, topographic, population, vegetation, fisheries, power, and airlines maps; a chart of the southern sky; and a map Index to some 1,800 places.

The Story of New Zealand Place Names: *a brief account of the origin and meaning of one thousand five hundred well-known Maori and Pakeha place names of New Zealand.* By A. W. Reed. A. H. & A. W. Reed, Wellington. 1952. 143 pp., many line drawings. 15s.

The first two books mentioned are full of names. This little book is for the many who have to know, for the sake of knowing, what a strange name means, or what or who something was named after. Wherever the British went (or wherever the Spanish or the Germans or the French or the Dutch went) they took their names with them; but fortunately in New Zealand a large proportion of native — Maori — names would not be displaced. Maori names are probably not as hard to pronounce (no key in the book) as they look; and many can be broken down into components, a list of which is given. Thus: *nui*, big; *whanga*, bay — *Whanganui*, "big bay," or more correctly here, "great harbor." (The actual place, on the North Island coast, has been corrupted to Wanganui, as many Whanga- names have.) Another class to look out for is that of Maori forms of foreign names — Hiruharama (Jerusalem). One can easily get completely absorbed in this fascinating subject.

The history of New Zealand is essentially a story of two peoples, Maori and Pakeha (European); such precursors of the former as there were have scarcely figured. Maori history emerges from legend a thousand years ago; European begins in 1642 with the Dutch navigator Tasman.

Myths and Legends of Maoriland. By A. W. Reed. Angus and Robertson, Sydney. 1950. 230 pp., many illustrations in line. 12s. 6d. (On the Reed list.)

Listed as a juvenile, this imaginatively illustrated little book would correspond to the best of American compilations of Indian legends, and undoubtedly serves the same bedtime reading purposes. The mythology begins appropriately with Heaven and Earth — all was darkness while Rangi the Sky-father lay long ages in the arms of Papa, the Earth-mother. Their God-children longed for light. Tane the god of trees thrust against the Sky-father to loosen his hold, "and the angry winds screamed through the space that had opened between earth and sky. Tane and his brothers looked round on the soft curves of their mother. For the first time they saw her in all her beauty, for the light had crept across the land. . . . The gods breathed the free air and planned their new world."

The Coming of the Maori. By Te Rangi Hiroa (Sir Peter Buck). Maori Purposes Fund Board: Whitcombe and Tombs Ltd., Wellington. 1952. 551 pp., 96 text figs. in line, 24 halftone plates. 35s.

With Kupe, legend begins to merge into history. To admit the traditional first discoverer of the pristine land now New Zealand to history is to admit him to the company of the world's greatest navigators. If such a Polynesian sailed a

unknown oceans, circumnavigated the North Island, "reached Hawaiki safely" and gave "information to the home people about the great land with the high mists," he indeed made one of the epic voyages of all time. According to genealogical reckoning it must have been around the middle of the tenth century. In any case it appears correct to speak of "the arrival of the Fleet in 1350," and date the actual Maori settlement of New Zealand from that year even though the land was found inhabited by a people who presumably came during the interim after Kupe.

The present book, however, is less a history than a summation of Maori culture in all its aspects. It is fortunate that this scholarly but not heavily technical source book has been left to us by a man who was son of a Maori mother yet whose eminence in anthropology won him a professorship at Yale and the directorship of the Bishop Museum. Here indeed is the inside story of the Maori by a Maori equipped with all the modern techniques of interpretation and comparison. Book I: The Coming of the Maori, contains, besides origins, discoveries, and settlement, a chapter on Maori speech. Book II: Material Culture, has 13 chapters on food, houses, clothing, tools, art, etc. Book III: Social Organization, tells of family and tribal relationships, community life, education, etc. Book IV: Religion, contains the creation myths as well as all aspects of the religious practices of a people who "had faith in their gods." In a brief Epilogue Te Rangi Hiroa disposes of the idea that the Maori is headed toward extinction – "the mournful prospect" that, "in view of the marked increase in the Maori population, happily may be cast aside." He believes that "the future of the Maori people is to be neither extinction nor absorption so complete as to make them lose their identity. What is taking place and what will continue to take place is a blending of the two races, a blending which will, in time, produce the future New Zealander who has derived physical and cultural superiority through the intermixture of two bloods . . . The Maori past will blend into the New Zealand future."

Captain Cook in New Zealand: *extracts from the journals of Captain James Cook giving a full account in his own words of his adventures and discoveries in New Zealand.* Edited by A. H. & A. W. Reed. A. H. & A. W. Reed, Wellington. 1951. 262 pp., illus., maps, facs. of Cook's "Chart of New Zealand" (1772). 30s.

For one hundred twenty-seven years after Tasman New Zealand saw no European sail. It was 1769. "To one great question the answer remained ungiven: did the southern continent in fact exist? Over an entire half of the ocean no ship had yet sailed. Was Australia, in all its amplitude, yet but an outlying sentinel of a land of boundaries almost infinite? Was New Zealand the northern limit of a coast that stretched impregnably to the Pole?" (J. C. Beaglehole, *The Exploration of the Pacific*).

"Then came James Cook, who may be said to represent the scientific, skeptical temper of the eighteenth century, as well as the practical spirit of the English sailor carried to its highest degree of competence. His thirst for exactitude in geographical knowledge was insatiable; his efficiency in its pursuit was unparalleled in an age of excellently efficient seamen. His voyages were the climax of the old search for the southern continent, and although they illustrate, certainly, a phase in imperial competition, they illustrate with equal certainty that competition might carry over into the region of disinterested discovery.

"In the process of laying bare the last secrets of the Pacific in three voyages of amazing amplitude, Cook visited New Zealand five times; but the main part of its discovery and the essential charting of its outline were done in the 'Endeavour' on the first voyage, which raised maritime exploration to a new plane" (Beaglehole, United Nations Series *New Zealand*, Ch. I, "Discovery and Exploration").

The distinguished lecturer in history at Victoria University College in Wellington is quoted at some length because he so succinctly puts Cook's New Zealand exploration in context, thus giving emphasis to the value, to New Zealanders at least, of the handsome Reed edition of the parts of Cook's journals relating to that country. In their Introduction the Messrs. Reed take note of the texts followed and, quoting Chapman, expand Dr. Beaglehole's observations, describing the *Endeavour* and the conditions of eighteenth-century voyaging. Mr. A. W. Reed contributes a brief biography; and Mr. C. R. H. Taylor of the Alexander Turnbull Library a "Note on the Literature Relating to Captain Cook's Voyages"–the latter of particular interest to bibliographers.

The Story of New Zealand. By A. H. Reed. A. H. & A. W. Reed, Wellington. (Sixth Edition) 1952. 460 pp., profusely illustrated, endpaper maps. 20s.

This brings us to a most engaging work by the senior partner of the great-uncle–grandnephew firm of Reed. Having the young as well as the general reader in mind, Mr. A. H. Reed has written history with a clarity and

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simplicity and with a liveliness that might well serve as a model for any writer of history. With six editions in seven years, it is time-tested. Opening with the geologic record of prehistory, it goes on to retell the Maori origins, and the Tasman, the Cook, and later voyages of discovery. What follows then is the rough era of sealer and whaler and trader – exploiters of newfound islands. Then came missionaries, intensive land exploration, and, inevitably, European settlement, which led to the setting up of the Crown Colony with the Treaty of Waitangi in 1840. The terrible decade of the Maori wars, 1860-1870 (the last Maori king, Tawhiao, laid down his arms in 1881), is recounted in a spirit of fairness to both Maori and Pakeha. The growth and coming of age of the New Zealand nation complete the stirring chronicle, which ends with the accession of Governor-General Sir Willoughby Norrie in 1952. The reading of this book brings understanding and respect for this small, great nation in the South Pacific.

New Zealand. Edited by Horace Belshaw. The United Nations Series. University of California Press, Berkeley and Los Angeles. 1947. xvii + 329 pp., illus., maps and charts. $5.00.

A comprehensive, analytical survey, readily available to American readers, is this symposium by twelve authors, all of them New Zealanders or having served in New Zealand in various official capacities. The 14 chapters are grouped in four parts: Background, Economic and Social Development, Cultural Development, Government and Foreign Policy. Invaluable for a working knowledge of one of the world's most progressive countries.

Preliminary Reports of the New Zealand–American Fiordland Expedition: *Investigations in Fiordland, New Zealand, in 1949.* Compiled by A. L. Poole. Bulletin 103, New Zealand Department of Scientific and Industrial Research, Wellington. 1951. 99 pp., photographs, charts, map. Paper, 7s. 6d. (On the Reed list.)

Many *PD readers* will recall the article (May–June 1951) "New Zealand's Fiordland" by Olaus J. Murie, scientific leader of the Expedition, and noted American naturalist and conservationist. The Expedition came about through another American, Colonel John K. Howard, who became interested during the war in the status of the wapiti that had been introduced into the wilderness of the South Island in 1905. The Expedition became a full-fledged scientific survey of virtually unexplored territory, with 60 people taking part.

New Zealand Nature Study. By Wm. Martin. Whitcombe and Tombs Limited, Christchurch. (Preface dated October 1947.) 263 pp., illus. 14s. 6d.

This solid manual was "prepared primarily for use by the teachers of the Dominion" but teaches principles, gives a summary of the more intimate aspects of nature in New Zealand, and forms an interesting comparison with American manuals and methods.

Bird Secrets. By Major G. A. Buddle. A. H. & A. W. Reed, Wellington. 1951. 71 pp., 93 photos by the author. 20s.

With birds the dominant element of the New Zealand fauna, this beautiful and well printed work by an outstanding photographer and bird hobbyist should appeal to bird lovers everywhere. In his Foreword, R. A. Falla, New Zealand's leading wildlife authority, calls Major Buddle "an experienced naturalist."

Forgotten Islands of the South Pacific: *The Story of New Zealand's Southern Islands.* By Rosaline Redwood. A. H. & A. W. Reed, Wellington. 1950. 125 pp., numerous photographs, maps. 10s. 6d.

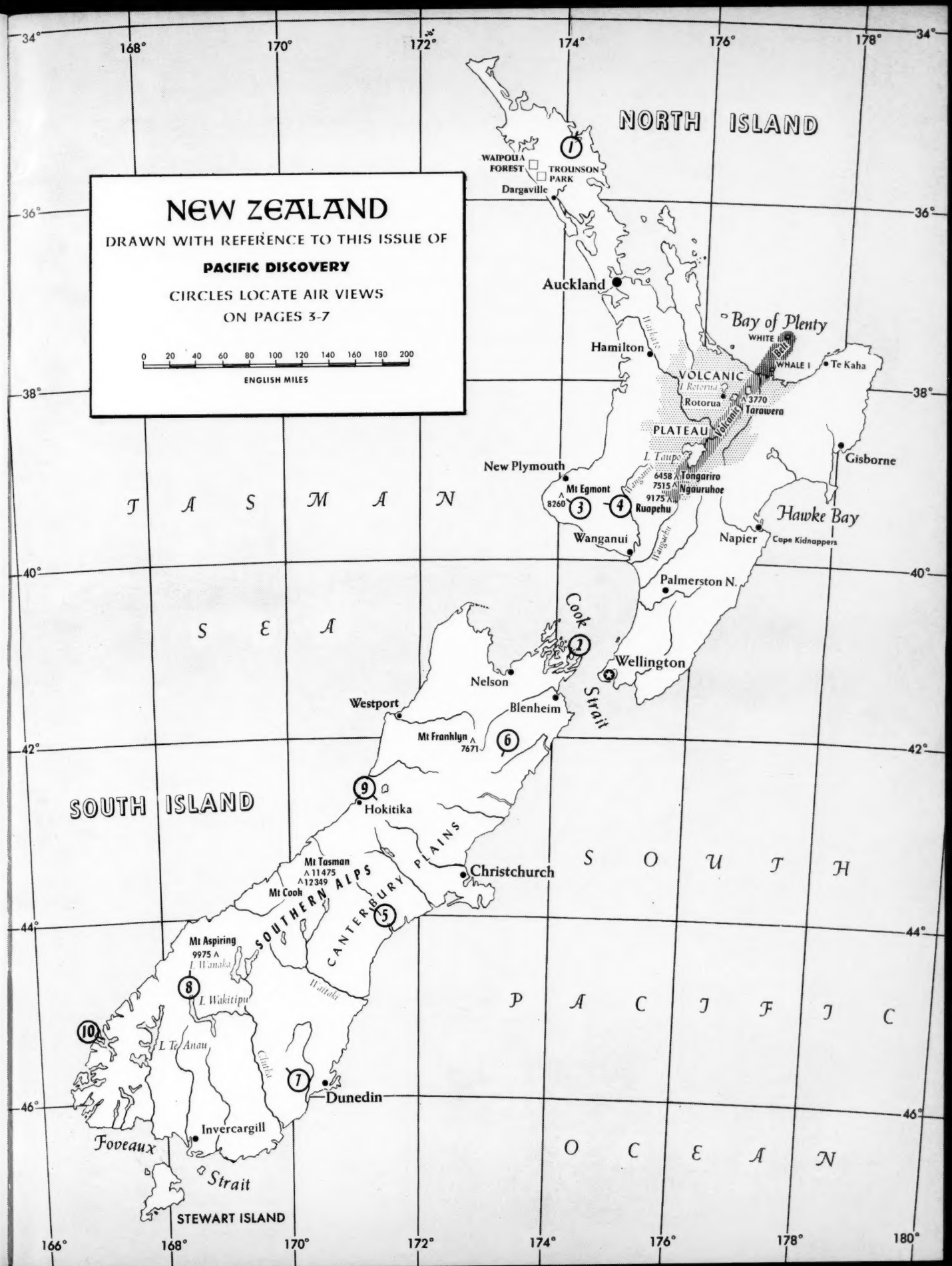
The Solander, Bounty, Antipodes, Snares (Traps), Auckland islands; Campbell, Macquarie, Codfish, Ruapuke, Chatham, Pitt – all but forgotten today indeed, New Zealand's small southerly dependencies played a dramatic part in the days of sail, sealing, and whaling. Chatham and its tiny outlyer Pitt alone are now inhabited in the proper sense – they are due east of Christchurch, South Island. Most have a history of suffering – shipwreck, starvation, marooning, murder. Nature lured men with the hope of quick riches from the teeming seal herds. Men showed their utmost in stupid greed and sickening brutality. The seals gone, nature has reclaimed the wreckage for patient rebuilding; unbearable climate and lack of soil bar other use. But the grim story (with its inevitable heroic episodes) was worth telling, and is here well told.

The Auckland Islands: *Their Eventful History.* By Fergus B. McLaren. A. H. & A. W. Reed, Wellington. 1948. 109 pp., photographs, drawings, maps. 12s. 6d.

Chief among the southern islands is the Auckland group, where in 1849 Charles Enderby, scion of the famous English whaling house of Samuel Enderby and Sons, attempted to found a permanent colony for the Southern Whale Fishery. The venture was one of the colossal fiascoes of the century. Man once again failed to take proper account of nature. "To-day the drama seems to be ended," the young author (killed in the war) says in conclusion, "for so far as can be seen, the islands will have no future history. The bleak climate, the unproductive soil, and the isolation of the Auckland Islands under the changed conditions of a modern world, suggest that, in the loneliness of the Sub-Antarctic Ocean, they will be 'world forgetting, by the world forgot.'" Their story is a closed chapter in Pacific discovery.

Volcanoes as Ladscape Forms. By C. A. Cotton. Whitcombe and Tombs Ltd., Christchurch. 1952. 416 pp., profusely illus. with photographs, line drawings, charts. 35s. ($6.50 in U.S. through John Wiley & Sons, Inc., New York.)

It would be hard, we imagine, for a New Zealander to be unaware of his landscapes, especially where as in the Volcanic Belt they may suddenly take on a new look. Professor of geology in Victoria University College, Wellington, Dr. Cotton is a geomorphologist of international repute. Changing landscapes – their hows and whys – appear to be his specialty; *Climatic Accidents in Landscape Making* (Whitcombe and Tombs; John Wiley & Sons) is another of his books in this field. In *Volcanoes*, a short introductory part discusses the mechanism of volcanism, but the author is frankly less concerned "with theories of volcanism and petrogenesis" than "with landforms of volcanic origin." He deals with such features from the world standpoint, drawing heavily on New Zealand examples to illustrate principles. D.G.K.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